

The Arte of shooting in great Ordnaunce.

Contayning very necessary matters for all sortes of
Seruitoures eyther by Sea or by Lande.

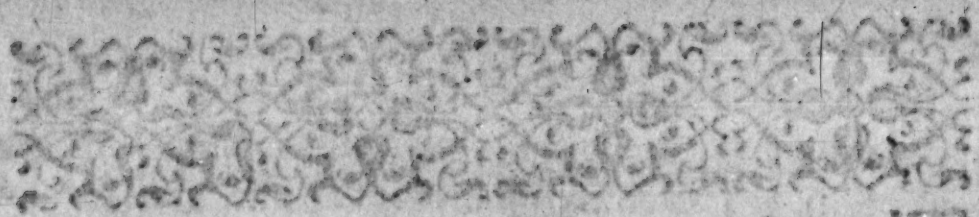
Written by William Bourne.

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Imprinted at London for
Thomas Woodcocke,

1587.

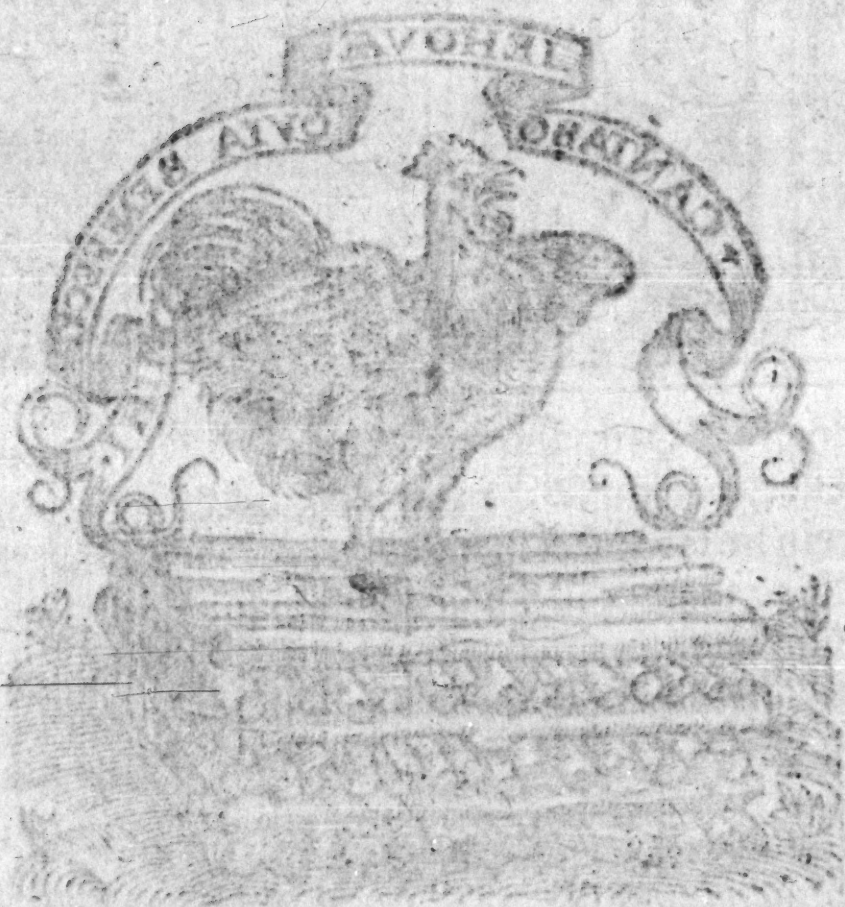


The Art of Shooting in Great Ordnance

Containing very necessary matters for all sorts of
Sergeants either by Sea or by Land.

Written by William Brouncker.

(1)



Printed at London for

Thomas Woodcock.

1787.

✠ TO THE RIGHT
honorable Lord, Ambrose Dudley,
Earle of Warwick, Baron of Lisle, of
the most noble order of the Garter Knight, Generall
of the Queenes Maiesties Ordnauce within her highnesse
Realme and Dominions, and one of her Maiesties
most Honorable priuie Counsell, *William Bourne*
witheth long life, increase of Honor,
with al happy successe.



Ight woorthie and Noble
Earle, whereas I before this
time haue writtē sundry sim-
ple Treatises, whereof two of
thē are extant in print, thone
called the Regiment of the
Sea, and the other the Trea-
sure for Trauellers, and now
also this barbarous and rude
thing, called the Art of shoo-
ting in great Ordnauce, and as it is most cōmonly seen,
that euery person doth most cōmonly cōmend that thing
wherein he is most expert, and therefore some there are
that doe most extoll Diuinitie, and great reason it is that
it should be so, for that it teacheth vs both to know God
and to instruct others: also other some doe most preferre
Philosophie: other some the Lawe, with such like as they
are most delighted in. Also other there are, that doe not
onely extoll them, but wil make arguments, and dispute
whether of them are most commendable and most wor-
thie to be preferred aboue the other. There are also, that
after long disputation, doe not onely assigne euery Sci-
ence his seuerall laude and praise, but also discourse whe-
ther of them are most necessarie for a common wealth,
And I am of that opinion, and that no man can denie,

The Epistle.

but that the Arte of shooting in great Ordnance is necessarie to be aduanced for the defence and mainteynance of a Kingdome, and countrey, and the common wealth thereof. Wherefore (Right honorable) being as one extraordinarily bolde, I present the same vnto you, for that I knowe your Lordshippe can truly descerne and iudge in these causes, as one whose wisedome is not vnknowne, hoping that your Honour will take this simple worke, as my good will, rather than the valour of the thing, or the finenesse of the penning of the matter. And thus I cease to trouble your Honorable Lordship any longer at this time, desiring you to accepte this simple Booke at the handes of a poore Gunner, as a true token of my good will towards your Honour: desiring God to prosper your Honor in all your doings in perfect health.

By your Honours humbly

at commandement

William Bourne.

The Preface to the Reader.



Entle Reader, it is possible that you would marvel that I should write this booke called the Art of shooting in great Ordinance for two great causes: the one is this, first for that I haue not scene (to most peoples iudgement,) so great experience in these affayres, whereby you may thinke that I haue not knowledge sufficient to be a teacher in these matters. And the second cause is this: for that my order of teaching is contrary vnto all that haue taken vpon them to be teachers, or instructors in these matters or affaires before time. Therefore for to shew vnto you the cause that hath moued me to write this rude volūe, is this, for that we English men haue not bene counted but of late daies to become good Gunners, and the principall point that hath caused English men to be counted good Gunners, hath been, for that they are hardie or without fear about their ordnance: but for the knowledg in it, other nations and countries haue tasted better therof, as the Italians, French and Spaniardes, for that English men haue had but little instructions but that they haue learned of the Douthmen or Flemings in the time of King Henry the eight. And the chiefest cause that English men are thought to be good Gunners, is this: for that they are handsome about their Ordinance in ships, on the Sea, &c. And furthermore, I doe thinke it good to shewe vnto you three great causes besides diuers other small causes, that the thing that hath letted or hindred English men to become cunning in the shooting of great Ordinance, although diuers prooues haue bene made at sundrie times, and Ordinance hath bene had into the fielde, both in maister Bromefields time whē that he was Liefetenāt of the Ordinance, & at diuers times since, and yet those prooues that haue bene made then were no proofes, but to cause those Gunners that did see the experience of those proofes, to committe a further error as touching the shooting

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The Preface

ting in great Ordinance, and the reason thereof is this: the first & principal cause is, that they did make their prooffe with a Quadrant, and so it ought to be, that is to say, the fourth parte of a Circle deuided into 90. equall partes, which some simple Gunners will call a Triangle, but there is no instrument so called, but onely a Quadrant: and the original of the making thereof is the fourth part of a Circle deuided into 90. equall partes, what forme so euer that it hath. And now the principal vse of the quadrant, is to know what any peece will cast at the mount of euerie Degree, and so from degree vnto degree, vnto the best of the Rander. And the cause that hath made the Gunners to commit error by the mounting of the peeces by the degree of the Quadrant, hath beene this, although that it be true that such a peece will cast the shot so many cores at the mount of so many degrees, and yet whe that they haue made prooffe thereof, they haue found it meere false, & yet the thing most true, although sometime the shot hath flien a great deale further, and sometime much shorter, which causes were no other thing but the highnes or the lownes of the ground, for that there is seldome any ground that you shall find leuell, but it will be higher or lower then the ground that the peece standeth vpon, as I doe more at large declare in the thirtenth chapter of the booke, and yet in the time of service there is no vsing of the Quadrant but in some cases, and then take a great large one, for in a small you may soone commit error. And furthermore I doe know diuers that will haue instruments, and yet be utterlie void of the uses of them, for it is the reason of the person in the doing of any thing, and not the instrumentes, for in the doing of any thing, if the person doth not consider of all thinges with him and against him, he or they be apt to commit error, &c. The second great cause is this, in the vsing to giue leuell with a rule set out in inche partes: but vnto this they cannot order it, nor giue it no Method to know what any peece wil doe at any number of inches aduantage, for the peeces doe differ in casting, according vnto their lengths, as I doe further shew in the booke. Wherefore the vse of the inche rule according as they doe vse it, is to no other

to the Reader.

ther purpose, but onely to seeke out what numbers of inches will reach the marke, and that being knowne, then to keepe the length of the marke with that peece. And the necessariest thing that this kind of giuing of lenell in the time of seruice (as being in a Castell, Forte, or Towne, or such like, the Gunner hauing charge of any peece,) is to beate al those markes that be apte to doe any seruice at, and to know how manie inches will reach any marke, &c. but to become a cunning Gunner, he shall neuer be, although he should shoote 100. shottes euerie day through a yeere, for that he neuer doth know by that meanes the distance of any marke, but in euerie peece he must make a new prooffe, if that the peece be remo-ued or chaunged from that place. Wherefore I haue made a table shewing how many inches, and what part of an inch will make a degree, and so vnto ten degrees whereby you may make a Methode to hit the length of the marke in anie peece at the first shot, as it doth appeare in the eighth chapter of the booke, if so be that there were a true and exact table of proportion, of the casting of the peece at the mount of euerie degree, but I haue not had so greate prooffe but that I may bee deceined, for I haue no other prooffe but at my owne charges, and my abilitie is able to doe nothing to make any prooffe in those causes. The third great cause is this, I do know few Gunners, yea none at all in respect, that hath anie capacitie, to know the distance vnto anie marke assigned, if that the marke be such that they can not come vnto it directly by land, and yet there be verie true and exact wayes to know the distance vnto anie marke assigned, howsoeuer the thing is, if that it may be seene by Geometrie perspectiue: and the lacke therof amongst Gunners is the principallest point that doth deceine the, so that these three things doe vitterly deceine most men: the first is this, the height or lownes of the ground: the second the length of the peece: and the third not knowing the distance vnto the marke: for their reason in these causes that they doe suppose, can doe nothing, that is to say, to finde the distance vnto anie marke assigned, by looking vpon the ground, and that neuer can shew vnto them the distance vnto the marke but yet must be knownen either

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ther by the Scale or crosse staffe, or else it must be knownen by the lines of Position, which is shewed in a booke of mine that is extant in Print, called the Treasure for Trauelers, and also in a booke set forth by master Thomas Digges called Pantometria, wher in those two bookes you shall finde meanes and waies both how to finde the true distance vnto the marke, and also how much that the marke is hier ground or lower ground, then the place that you are vpon, and also the length of the line Hipothenusall, whether it bee vppe the hill or downe the hill, which is verie necessarie and profitable for all them that will vse to shoote in great Ordnance, for to know, as all Gunners, Captaines, and Leaders of men, &c. And now friendly Reader, it is possible that some people will dislike of me, for that I haue written this booke: some of them for that they doe thinke that they haue better knowledge in those matters then I, and other some perhaps may be offended, for that they would not haue the thing knownen but amongst themselves, and other some possible will be offended with me that are Gunners, that are altogether without any knowledg in those causes, that would not haue their ignorāce knownen. So by these meanes I am assured that I shal purchase a great number of enemies, as I do know that I haue already caused sundry people to enuie me, as some Sea men do mislike of me for writing of my booke called the Regiment for the Sea, and other some of late are offended with me for the writing and setting forth of my booke called the Treasure for Trauelers, but notwithstanding, I doe see that it is needfull to be knownen vnto a number of them that be Gunners, waying and considering with my selfe what a number there bee, that will take vpon them to be Gunners, yea and that maister Gunners, that are not sufficient nor capable in those causes, but are in respect altogether ignorant, standing vpon no other thing but their antiquitie, that they haue serued as Gunners so long time. Wherefore I doe thinke it very necessarie for them to haue some good instructions: but as farre as I can see, euerie man maketh curtesie to doe the common wealth of our Realme of Englande any good therein, and as far as I can perceine that no people

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ple may better pleasure the common wealth in the time of service, either by Sea or Land, then may good Gunners against the face of our enemies: for the Realme of England hath a great number of enemies: for as we haue seene by daily experience, that the Queenes progenitours aforesime were neuer long without warres, yet we haue a most gracious and louing Prince raigning ouer vs, which doth alwaies studie for peace and tranquillitie: God graunt of his mercie that she may liue long and raigne ouer vs. Amen. Yet notwithstanding, it is good for vs to studie in the time of peace, how to defend our selues in the time of warres & troubles, as generally we prouide in haruest for to liue in the winter. And for that cause haue I written this little treatise, not to the intent to teach the that be cunning, but to giue instructiōs vnto the that be of the simplest sorte, &c. Wherefore (Gentle Reader) beare with my rudenes, for that I am so bold to be the first English man that put forth any booke as touching these causes, and it is possible that there be a number would looke that I shoulde haue giuen them place, for that they are more worthy and skilfuller in these causes, thinking that I am too simple, for they doe not consider how that God doth giue his giftes, as we see daily he giueth vnto one man riches, and another man pouertie, and one man to be a ruler, and an other to be inferior, one man wise & prudent, and an other ignorant, one man beautifull, and an other deformed, one mā of a tall stature, & an other of a low stature, one man strong and lustie, and an other weake & lame: although that they be of one consanguinitie, limitie or kindred, such is the marvelous workes of God. Wherefore men are not to be measured by elles, but by vertue, for God is not partiall in his giftes, for hee hath shed his most precious blood for the redemption of all mankind, so that afore him all are one, for we are all his creatures and the sheepe of his pasture, and the workes of his handes, so he is our God, and we are his people, so that we keepe his holy will and commandements, but flesh and blood is so fraile, that we can doe no good of our selues, for God worketh the will and deed in all his creatures, for by his holy spirit he doth giue sundry gifts & al for
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the profite both of our soules & bodies, as Saint Paul saith to the Corinthians, to one is giuen through the spirite the utterance of wisdom, to another the utterance of knowledge, by that same spirite to another faith, by that same spirite to another the gifte of healing, by that same spirite to another professing, to another iudgment to discerne spirits, to another diuers tongues, to another the interpretations of tongues, and al those doth the spirite of God worke and distribute vnto euery man according vnto his most holy will and pleasure. Then what a vaine generation of people be we to strine against the wil & pleasure of God, as who should say that God is bound to be ruled by the wil and pleasure of man. But what speciall gifte soeuer God doth giue vnto man, let them giue him thanks therfore, and looke that they doe not abuse the same gift, for if that they doe, it will be a snare to take them in, and so be an example vnto the whole world. For as soone as our heart is lifted up with vanities, then entreth the Diuel, & he causeth a man to fall and decline from God, thinking with our selues, that the gift that God hath giuen vnto vs commeth of our selues. For as some do think that haue riches, that they haue it by their own industry, and some doing diuers other thinges, thinke that it commeth of themselves, with diuers other speciall gifts that god giueth vnto man, therefore when soeuer God doth giue any speciall gift to any person, then let him giue him thanks therfore, vsing it to the laud, praise, glorie, and honor of God, & to the profite of his neighbour, and the common wealth of his Natiue countrie, for great is the wickednes of the people vpon the face of the earth, as considering this in these our dayes, that the Bishop of Rome with all his adherents, doth daily practise how and by what meanes to bring this our noble realme of England to vtter confusion, therfore it is very meete and necessarie for vs to deuise how to preuent them, and then there is no doubt if that we doe our good will and endeavour, but the liuing God wil deliuer vs from the hands and snares of such wicked Antichristes, that do seeke the blood of the Christian seruants of God. Wherefore it is very meet for vs that be faithful Christians and true subiectes to our prince and Countrie, to
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to the Reader.

arme our selues first with faith, secondly with manly courage, and thirdly with armor for our back, for let vs be assured without Gods mightie providence vnto the contrarie, that as soone as they haue vs at any aduantage, that then let vs looke for no other matter, but that they will giue the attempt, for such is the wickednes of the malicious Papists, yea eue some of them are those that should or ought to be good subiects vnto their Prince and native countrie. Wherefore I beseech the liuing God to cōfound such wicked Impes that should seeke the destruction of their Prince, and especially a vertuous, mercifull, and a godly Prince, and secondly the destruction of their native Realme and countrie, yea euen the nurce to them and their forefathers that hath yeelded vnto them all kind of foode and necessaries. What greater wickednes can there be in men? and they themselves are bound by the lawes of God and also by the lawes of nature, to defend their Prince and Countrie: for we nor they haue no iust quarell to fight by the lawes of God, but onely to defend our Prince and countrie and the liberties therof. Therefore it is meet for vs to cal vnto God for mercie and grace, and then there is no doubt but that he wil deliuer vs, & turne all their wicked deuises vnto their own destruction, euen as thē that make a pitte for other and fall into it themselves. Wherefore it is meet for al them that are Noble men and Magistrates, & such as are in authoritie, to cherish and maintayne al those that are good and vertuous subiectes and good members in the common wealth, and contrariwise, it is very necessary and conuenient to punish all wicked doers, and such as doe annoy and hurt the common wealth, hauing no regard, neither for loue nor fauour, nor hatred or malice, neither for bribes nor friends, but to rewarde euery man according vnto their desertes: for as it is sin to suffer vice unpunished, so in like manner it is as euill to see Vertue not reuwarded, cherished nor mainteyned.

Confession of Faith

I believe in God the Father Almighty Maker of Heaven and Earth
In Jesus Christ His only Son our Lord
Who was conceived by the Holy Spirit
Born of the Virgin Mary
Suffered under Pontius Pilate
Was crucified, dead, and buried
He descended into Hell
The third day He rose again from the dead
He ascended into Heaven
He sits at the right hand of the Father
He will come to judge the living and the dead
I believe in the Holy Spirit
The Lord and Giver of Life
Who comforts and sanctifies us
Who keeps us in the truth
Who will keep us from all sin
I believe in the Holy Catholic Church
The communion of Saints
The forgiveness of sins
The resurrection of the dead
The life of the world to come
Amen

¶ Considerations to be had

in shooting of Ordinance.

¶ Tenne principall things are to be considered in the shooting of Ordinance, to keep the length of the marke, or to make a perfit shotte at any marke assigned, according vnto the distance of the marke, and knowing what such a peece wil do at such an aduantage in mounting.

1. The goodnesse or badnesse of the powder.

The good powder driueth the shotte further than the marke, the badde powder shooteth short of the marke: therefore you must vse discretion in lading of the peece, according vnto the powder.

2. The lading of the peece.

If you doe giue the peece more than hir dutie, you doe ouershoote the marke: if you doe giue hir lesse than hir duty, you shoote short of the mark: you must therefore giue the peece hir dutie and no more.

3. The winde, and especially to be mounted at much aduantage.

The winde with you, causeth you to ouershoote y^e marke, according vnto the hardnesse. The winde against you, maketh you shoote short of the marke according vnto the hardnesse. The winde one the side, the peece casteth beside the marke: therefore you must weather the marke, according vnto the hardnesse of the winde, and the distance vnto the marke.

4. Of the shotte.

The shotte too bigge or too high, it putteth the peece in daunger: for you must driue the wadde and shoote home vnto the powder in the peece, for if the shotte doe rest any thing short, it will breake the peece (or else it is a chaunce) in the vacant place betwene the powder and the shotte. The shotte too low or small, it will be too short of the marke, & also it will not do his execution according vnto the peece and the powder, and it may chance to swaue in the deliue-

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rance out of peece, the therefore the shotte must be fitte for the peece

5. Of the wadde or the powder rammed in too hard or too loose.

The powder rammed in too hard, and the wadde also, and especially the powder being badde, or els not drye, it will be long before the peece goe off, and also halfe the force of the powder will be decayed, before the shotte bee deliuered, for that it bloweth out of the tutchhole, and also the peece will tremble before shee goe off, & that may cause the shotte to flee awrye from the marke, for that the peece is remoued from hir leuell: and also it will heate the peece, and make the peece dangerous to shooote in presently afterwards.

The powder too loose, and not well put vp with the rammer head, and also the wadde too slacke in like manner, will make the shotte to come short of the marke by the meanes of the loosenesse: you must therefore put vp the powder with the rammer head somewhat close, and the wadde to go close in, and drive it home vnto the powder, but beate it not in too hard.

6. Of the standing of the peece.

The peece standing so that it maye or both recople vnto the lower ground, that is to say, that the ground be lower at the tayle of the peece, than it is where the wheeles stand, it ouershooteth the marke, for that in the deliuerance of the shotte, the breech goeth downewards, and the mouth vppwardes, and the peece is apte to recople downe the hill: and if that the ground be higher behind the peece then it is before the peece, then it may happen to shooote short: but that is but a chaunce, for that is not so apte to recople agaynst a hill, as it will do downe the hill.

And if it doth happen so, that the one wheele dothe recople faster than the other wheele, then the peece will shooote awrye from the marke, or if any thing doe lette or stay the wheele, it may shooote awrye, for the deliuerance of the shotte causeth

causeth the recople of the peece, which is nothing else, but the suddayne thrusting or the putting out of the ayre whiche is in the mouth of the peece.

7. Of shooting towards a hill or valley with
a Quadrant.

If you shoote towardes a hill, you shoote shorfe in the giuing leuell with a Quadrant. If you shoote towardes a valley, you do ouershoot y^e marke, as in the thirteenth Chapter you shall se the reason therof. If vppon a leuell ground, you shall keepe the length of the marke by the degrees of the Quadrante, otherwise not.

8. If you giue leuell with an ynche rule, you shall shoote at no certaynetie, but in such a peece as you doe knowe wel, for that it doth varie according vnto the length of the peece: as for example this, if you haue thre Culuerings, the one is the ordinarie length, that is, twelue foote long: the other is more then the ordinarie length by two foote, that is, foureteene foote longe: and the thirde is shorfer than the ordinarie length by two foote, that is, but tenne foote longe: nowe if you doe shoote at any marke, and doe knowe the distance vnto the marke, and also doe knowe, that a Culuering mounted at so manye ynches vantage, wyll reach the marke, and admitte that it wyll reache the marke at twelue ynches vantage, nowe in the shorfer peece, it ouershooteth the marke, and in the longer peece it shooteth shorfe of the marke, and in that peece that hath the ordinarie length, you shall keepe the length of the marke: and the cause thereof is this: In y^e peece that is but tenne foote longe, the twelue ynches vantage commeth neere vnto syxe degrees wyth the Quadrante in the mounting: and in the peece of twelue foote long, the twelue ynches commeth not to fyue degrees in the mounting wyth the Quadrant, and in the peece of foureteene foot long, it commeth but vnto foure degrees in the mounting wyth the Quadrant, as in the eyght Chapter you may plainly see.

9. It is to be considered what dispart your peece must haue, if you doe giue leuell with an ynche rule at any aduantage, and also, if you doe shoote at any marke within the right line or popet plancke, as in the fourth Chapter it is shewed.

10. You must consider whether the peece be true-
lie bozed, as it is declared how you shall know
it in the second Chapter: and how to
choose with a peece that is not
truely bozed, you shall see
by the eleuenth
Chapter.

Ch

The Arte of shooting in great Ordinance.

How to know the goodnesse or badnesse of Powder.

CHAPTER I



First concerning Powder, for that it is the chiefest matter as touching the shooting in Ordinance. According to some Authours, the first denice of the making thereof beganne in Germany, by a Monke named Bertholdus Schwartzus, neere about the yeare of our Lorde. 1380. and since that time it hath bine put in practise from time to time, and from age to age, both by the learned Mathematicians, and also by the best Machanifianes, besides a number of other common people, as well by them that have bine seruetours, in martiall affayres, as all other, so that of the making of the peter, and also of the powder, hath bin made great prooffe vnto the vttermost, as touching the force of powder, so that it is not vnknowen now in these dayes, what quantitie of euery seuerall sortes of receiptes both make the strongest sortes of powder, besides the perfit refining of the salte peter, & also y^e thorough working of the receiptes in the making of the powder, so that it is now come to passe in these dayes, that the making of the powder, and also the making of the saltpeter, is become (in respect) a common thing amongst a number of people, as it is made commonly in many partes in Germanie by the Houres or husbandmen, and also by the women: wherefore it were but superfluous to say any thinge therein, considering how well the making thereof is knowne vnto a number of people, and therefore the principallest thinge in the shooting of Ordinance, is to knowe the goodnesse or the badnesse

nelle of the powder, and that is knowen after the common
 order, that is, by three kinde of meanes, first by the tasting
 of the tongue, knowing by the sharpnesse thereof, whether
 that there be sufficient of the maister or peter or not: and se-
 condly it is knowen by the coulour, for the good powder
 hath somewhat a blewish coulour, and if it be Serpentine
 powder, then the powder will be as fine as sande, and as soft
 as floure, and that signifyeth, that it is well wrought, and o-
 therwise it will be harsh in your hande, and clammysh, and
 looke with a darkish blacke coulour, and that signifyeth that
 it is wel wrought, and the maister not refyned: and the third
 & principall is knowen by the burning, for if it be verie good
 powder, then in the burning, the fire will be gone in y^e twink-
 ling of an eye at a verie suddayne, & wyl give a snap or sud-
 dayne puffe, & nothing remaining afterwarde, but a white
 smoke on that place whereas it was burned: but badde pou-
 der in the burning fireth not so quickly, but fireth as dothe
 a fire worke, very slowly, makynge some hissing, and after the
 burning, there wyl remaine certayne burres or knottes
 that wyl consume vnto moysture, and be dankishe, and that
 signifyeth that the peter or maister was not well refyned,
 neyther the powder well wrought: And after the burning of
 some kinde of powder, there wyl remaine certayne whyte
 burres, or knottes (as before is rehearsed) that will remaine
 hard, and not consume after the burning, and that signi-
 fyeth, that the powder dothe lacke of the maister or peter.
 And also here is one principall thinge to bee noted, that
 when powder is drye, then the force of it in respecte, is as
 it were double, or a quarter stronger, than when it is
 moyste and dankishe, whether the powder bee goode or
 badde. And also that powder that is verie good and well
 made, yet maye happen to become moyste, as manye
 times by carriage too and fro in rayny weather, and also by
 laying it in some moist places, the caskes beeyng not very
 close

close and tyght, that the powder may growe dankish.

And also those kinde of powders that the pether or matter is not well refyned, but left full of salte, although that the powder bee neuer so drye when it is layd vp, yet it will giue agayne in rayny or heather, and become moyst, how drye soeuer the place be that it is layde vp in. Wherefore there are a number of thinges to bee considered in powder, as touching the shooting in great Ordinance, in a number of causes: for men of reason maye know by the burning, coulour, tastynge, and the handling of powder, which is good, & which is badde: but to say iustly how much the one sorte of powder is stronger or weaker than another sorte of powder is, that is harde to knowe, although he be the maker of the powder, and hath wayed out perticularly the receiptes of the powder: and the meanes thereof commeth to passe, as this, by the working thereof, and by the meanes of the drying thereof, and by the moistning or giuing of it againe, and especially if the powder haue bin long made: so that it is a hard matter if a man haue of sundry sortes of powder, to say iustly that thus much in weyghte of this sorte of powder, will doe as much, that is to say, to bee equall in force, as so much in weyghte of that sorte of powder, vntill that it be putte in pzoofe in the shooting it in Ordinance. And thus I doe ceasse to write any more at this time of Powder.

To

The Arte of shooting

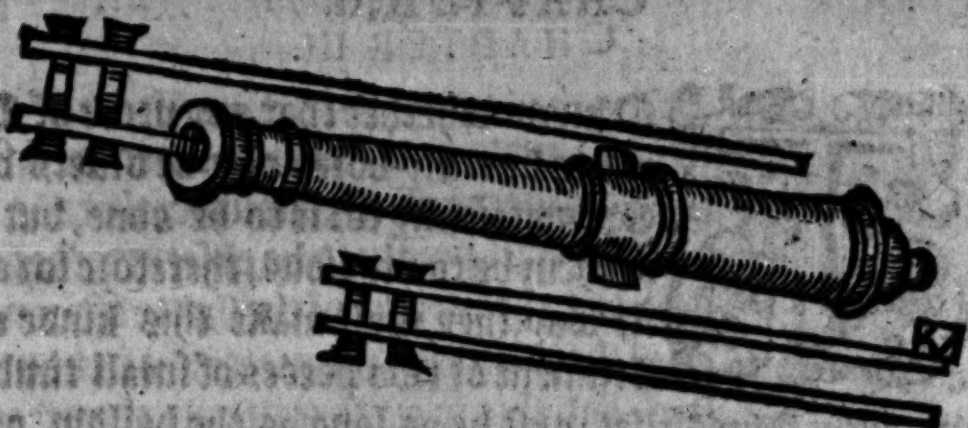
To know whether any peece of Ordinance
*be truely bored, by the helps of
certaine instrumentes,*

CHAPTER II.



I know whether that any peece of Ordinance be truly bored, ther be diuers waies Geometrically for it to be done, but some of them be too tedious, therefore for an easie way, they must make this kinde of instrument of two peeces of small timber, or two right staves, that must be as long as the hollow or concavie of the peece, which must be made in this forme, & the staves must be made so fast at y^e one end, that it be not wider asunder at the one end, than it is at the other end, & so made fast, that they shalve not eyther wider or narrower: and then putting one of the staves into the mouth of the peece, and so measuring or trying the peece rounde about with the staffe that is without the peece, with an ynche rule, you shall know whether that the core or hollownesse of the peece do vne right in the middle of the mettell, and if it doe not, you shall see howe much the mettell is thicker on the one side, than it is on the other. And also it is very good for you when you do meane to trie the peece, to prepare a rammer head that is made fitte for the peece, and to put it vppon the staffe that you do put into the peece, and to be made fast vnto the side of the staffe, and side of the rammer head, in such sort, that it may keepe the staffe close vnto the side of the peece, which it will do the better, if the rammer head be to low, and then to haue a peece of a Sheepes skinne made fast, or nayled vnto the contrary side of the rammer heade, and so it will keepe the long staffe close vnto the side of the peece, as by these two figures following you may perceiue.

And



And furthermore, they may make this kinde of instrument following, of yron, or any other stuffe meete for the purpose, for to gripe the peece in every place at your pleasure.



This instrumente muste bee double the length of the hollow or concauitie of the peece, and then you muste put one of the right ones into the mouth of the peece, and then griping the instrument together, then that parte that is without the peece, and that shall shewe you howe many ynches and partes of an ynche the mettall is of thicknes, without any fayle: and then tryng the peece round about in every place, the truth of the thicknes of the mettall shal appeare.

How much Powder will serue any peece of Ordnance, by the weight of the peece, and weight of the shot: and at the end of this Chapter, there is a Table that doth declare the weight of Iron shot.

CHAPTER. III.



I know how much powder will serue any peece of Ordnance, there be two speciall points to be obserued, that is to say, the weight of the shotte of yron, and the weight of the mettall of the peece: and this is a generall rule, the peece ha- uing a reasonable length, that is to say, that according vnto the accustomed manner, according vnto the names of the peece or peeces, all those peeces that haue two hundred weight of mettall, or bywardes vnto one pounce weight of shotte, must haue as much Serpentine powder as the shotte waieeth. And all those peeces that haue three hundred weight in mettall, vnto one pound weight of shot, doe require as much Serpentine powder as the shotte waieeth, and one ninth parte more. And all those peeces y haue vnder two hundred weight of mettall, and more than one hundred and a halfe, may haue as much Serpentine powder as the shot waieeth, lacking one ninth part. And all those peeces that haue one hundred & a halfe of mettall or thereabout, vnto one pound weight of the shotte, must lack $\frac{2}{3}$ partes of powder that the shotte waieeth. And all those peeces that haue but little more than one hundred, & vnder one hundred & a halfe, must lacke $\frac{1}{2}$ partes of y weight of the powder that the shot waieeth, y is but $\frac{2}{3}$ parts. Therefore for the making of Lables for any peece or peeces of Ordnance, this thing must be noted. First, take the compass of the shot for the peece y you do make the Label for, and then diuide, or put the compass of the shotte into .5. equal

equall parts, and the cut the plate of the Label in breadth of three of those five partes, and put the other $\frac{2}{5}$ partes away, and then bende the plate for the breadth of the Ladell, according vnto the compasse of the shotte, so that it may goe easily into the mouth of the peece: for $\frac{1}{5}$ partes is for to hold the powder, to the intēt to put it into the peece, and the $\frac{2}{5}$ partes be put away, to be open to turne the powder into the peece. And now furthermore, for the length of the plate of the ladell, heere is one thinge to be noted, that euery nine balles or shot being layde close together, and the plate being bent, and cut off that breadth before rehearsed, and the plate in length to be cut off, that number of ynches that the nine shottes dothe reache, and that plate being equally filled with Serpentine powder, wyl holde the iust weyghte in powder that the shotte weyeth. Therefore for the length of the plate of the Ladell, thus you must vse it as followeth. For to make a Ladell for a double Canon, and the peece weying generally more or lesse. 7000. or. 8000. and the shotte weying within little more or lesse. 64. pounce, that is, but little more than one hundred of mettall, vnto one pounce weyght of the shot, therefore this peece may lack $\frac{1}{5}$ part of the weyght in powder that the shot weyeth: therefore they must cut the plate of the Ladell but. 3. times the length of the shot, in ynches and partes of ynches, and this Label twice equally filled, shall be the dutie of the peece. Then for to make a Label for a Demy Canon, as the peece in mettall weyeth generally in ore or lesse. 5000 or. 5700. and the shotte weyeth more or lesse. 34. pounce, whiche is about an hundred and a halfe of mettall, vnto one pounce weighte of the shotte, therefore you must cutte the plate of the Ladell three shots or balles and a halfe high, or. 4. shots or balles high. In ynches and partes of ynches, according vnto the fortifying of the peece with the mettall, and the Ladell twice

equally filled, to be the dutie of the peece. And for to make a ladell for a double Culuering, those peeces being double fortified with mettall, and the peece waying generally more or lesse foure thousande, or foure thousande eyght hundred, and the shotte waying more or lesse 17. pounds, that is, about thzee hundred weight of mettall, vnto one pounce weight of shotte. Therefore you must cut the plate of the ladell in length about the height of fve shotte or balles, in ynches and partes: this ladell being twice equally filled, shall be the dutie of the peece. And in like manner the demy Culuering, and Falcōs, and Falcōnets, be double fortified with metall: therefore you must mak their ladell in length fve shottes or balles, in ynches or partes, and that ladell twice equally filled, shall be the dutie of the peece. And furthermore, some Sakars and Minions haue but two hundred weight of mettall vnto one pounce weight of the shotte: therefore you must cut the plate of the ladell in length but of foure shottes or balles & a halfe high: and that ladell twice equally filled, shall be the dutie of the peece. And furthermore, now of late yeares, they haue deuised a more stronger sorte of powder, and not without good cause why, for the base powder is not so good, if that it should come vnto seruice, as corne powder, or any other powder is, that hath receipt ynough, and well wrought: for the base powder dothe heate and streyne the peece more than the good powder doth: for if it be rammed in hard, the because it is not so quicke in firing, it lyeth and bloweth in the breech of the peece, before it can take fire, so by that meanes it heateth and stretteth the peece, and halfe of the force of the powder is gone, before y shotte be deliuered: and then they must vse batement for to saue the peece. Nowe whereas they shoote good powder, or corne powder, they take much lesse powder, and it sendeth the shotte quicker awaye, and it dothe not heate

heate the peece so fast: for this we doe see by common experience, that a little heat by long continuance, doth heat more than a great heat by little continuance. And furthermore, in the shooting of good powder, they shall not shew themselves so often vnto their enemies. And especially, the powder would be put in cartredges, for in mine opinion, it is a greate deale better, for to charge a peece in time of seruice with a Cartredge, than with a Ladell, for diuers considerations, as I doe more at large declare in the sixth Chapter. And furthermore, for to charge a peece wth coyne powder, or any other good powder, for the most parte, thereof two pounde will goe as farre as three pound of Serpentine powder. As for example: that double Culvering that requireth eyghteen pounde of Serpentine powder, twelue pounde of reasonable coyne powder will serue, according to the goodnes of the making of the powder. And furthermore, vpon good considerations, for diuers causes, and especially for the Queenes Maie, they haue deuised to make their Ordnance shorter than the accustomed manner, and so by that meanes they are lighter than the peeces before time made, and yet as seruiceable as the longer in some points, shooting that weight in powder, and y^e shotte that the heavier doth, in all poyntes as the other: for that mettall that is taken from the length of the peece, hurteth not the fortifying of the peece. And as for the making of the Cartredges for any peece, it is easie ynough to be done: for the compasse of the shotte, and the length of the Ladell, shall rule that matter well ynough. Nowe shall followe a rule to know the weyghte of the yron shotte, by the height of the shotte.

A Table to knowe the weight of
iron shotte.

A Shot of 2. ynches high, doth wey. 1. *lb.* 1. ounce. $\frac{1}{4}$.
A shot of. 2. ynches $\frac{1}{2}$ high, doth wey. 1. *lb.* 9. ounces. $\frac{1}{3}$.
A shot of. 2. ynches $\frac{3}{4}$ high, doth wey. 2. *lb.* 2. ounces.
A shot. 2. ynches. 3. quar. high, doth wey. 2. *lb.* 14. ounces.
A shot. 3. ynches high, doth wey. 3. *lb.* 12. ounces.
A shot. 3. ynches a quar. high, doth wey. 4. *lb.* 12. ounces.
A shot. 3. ynches $\frac{1}{2}$ high, doth wey. 6. *lb.* lacke. 1. ounce.
A shot. 3. ynches. 3. quar. high, doth wey. 7. *lb.* 5. ounces.
A shot. 4. ynches high, doth wey. 8. *lb.* 15. ounces.
A shot. 4. ynches a qua high, doth wey. 10. *lb.* 10. ounces.
A shot. 4. ynches $\frac{1}{2}$ high, doth wey. 12. *lb.* 10. ounces.
A shot. 4. ynches. 3. qua. high, doth wey. 14. *lb.* 14. ounces.
A shot. 5. ynches high, doth wey. 17. *lb.* 5. ounces.
A shot. 5. ynches a quar. high, doth wey. 20. *lb.* 1. ounce.
A shot. 5. ynches $\frac{1}{2}$ high, doth wey. 23. *lb.* 2. ounces.
A shot. 5. ynches. 3. quar. high, doth wey. 26. *lb.* 6. ounces.
A shot. 6. ynches high, doth wey. 30. pound.
A shot. 6. ynches a quarter high, doth wey. 34. pound.
A shot. 6. ynches $\frac{1}{2}$ high, doth wey. 38. pound.
A shot. 6. ynches three quar. high, doth wey. 42. pound.
A shot. 7. ynches high, doth wey. 48. pound.
A shot. 7. ynches a quarter high, doth wey. 53. pound.
A shot. 7. ynches $\frac{1}{2}$ high, doth wey. 58. pound.
A shot. 7. ynches three quarters high, doth wey. 64. *lb.*
A shot. 8. ynches high, doth wey. 71. pound.
A shot. 8. ynches a quarter high, doth wey. 78. pound.
A shot. 9. ynches high, doth wey. 101. pound.
A shot. 10. ynches high, doth wey 138. pound.
A shot. 11. ynches high, doth wey. 184. pound.
A shot. 12 ynches high, doth wey. 240. pound.
A shot. 13. ynches high, doth wey. 305. pound.
A shot. 14. ynches high, doth wey. 380. pound.

To

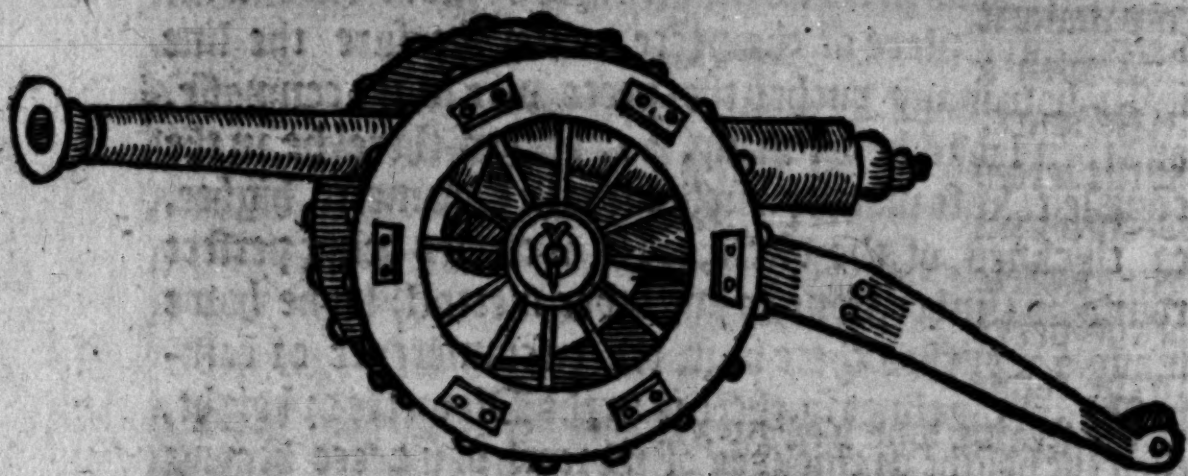
To dispart any peece of Ordnance
truely.

CHAPTER. III.

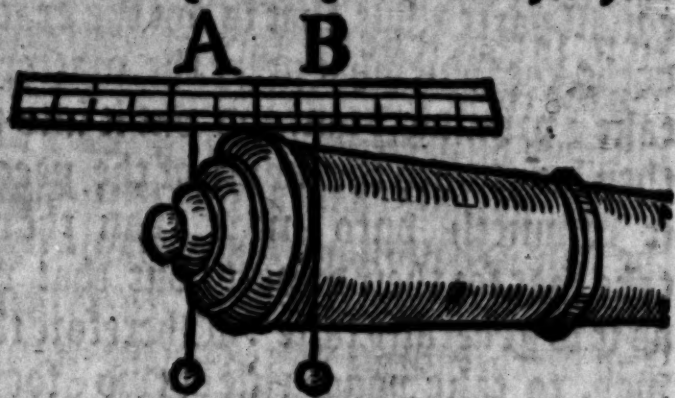


If all thinges belonging vnto a Gunner, the chiefest is, to bring the mettall of hys peece euen, for else hee shall neuer shoote iust to his marke, which Gunners call disparting of their peeces: and there be many wayes to do it. Nowe to disparte your peece, do this, take a string, such a one as will not stretch, then gird your peece about hir taylor or great ende, in the very biggest place of the peece, then measure the line iustly how many ynches the peece was in the compasse, and then looke howe many. 22. ynches there be in the compasse, take so many. 7. ynches for the Dyametre, highte, or thicknes of the circle, for in al circles being perfect round, as timber, stone, or any other mettall, looke howe many. 22. ynches there be in the circumference or compasse, so many times. 7. there is in the Dyametre or height, then the height or thicknes of y breech of y peece beeyng knowen, looke how many ynches and partes of an ynche it commeth vnto, then lay that vnto the mouth of the peece, and looke howe muche of that doth remaine ouer, then take halfe of that for your dispart. But some doe vse to gird them (as afoze is saide) and do put that into thre equall partes, but that is not the exacte way, although it dothe goe somewhat neere the matter. Some also will take a priming yron, and put it into the tutchhole, and then lay it vnto the mouth of the peece, and looke what it commeth vnto more than the measure, they will take that for their dispart: but that maye deceiue them, as it is generally false. Therefore this is a verye good way, to take youre rule of two foote long, and then lay

laye that crosse the tayle of the peece then take a plummet of lead vpon a line or a string. First holde the plumbe line on the one side close to the peece, that the line touche the peece without any bending, then on the other side, as circumspectly as you can, that the plummet line touch the side of the peece, without any bending, and then laye that measure to the mouthe of the peece, and looke what the ouermeasure commeth vnto, take halfe of that for your true dispart. Nowe for your better instructions by this figure.



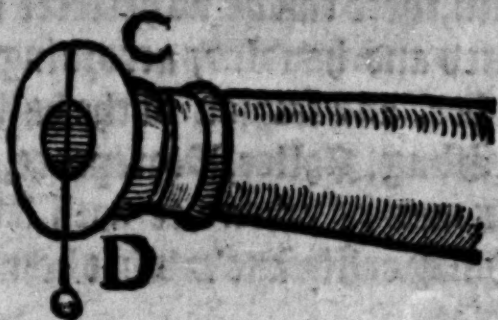
First I lay my rule of two foote long vpon the tayle of the peece crosse A and B and then I holde my plummet of leade first vpon the saide A as you may see, and then hold my hand vpon the other side B close to the side of the peece, then I do look how manye ynches the tayle of the



peece

peece was from A and B, and I finde it nineteene ynches and a halfe: then I lay my rule vnto the mouth of the peece C and D, and finde that the mouth of the peece is fifteene ynches, so there remaineth foure ynches and a halfe: then I deuide the foure ynches and a halfe into two equal parts, & that is two ynches and $\frac{1}{2}$ which I take for my dispart: then with my plūmet of leade, I goe vnto the mouth of the peece, and making a perpendicular line, and so I find the vppermost parte of the peece: then I take a strawe, setting that perfectly vpright, according to the dispart, two ynches & a quarter aboue the mouth of the peece, and make it

fast with a little ware, at the letter C, then bying y^e taile of the peece to the toppe



of the strawe which is my disparte, leuel with my marke, there is no doubt, but I shall make a perfite shotte, so that it be as farre as within the cast of the right line: for the disparting of your peece, is but to bying the mouth of your peece before, to be as high as the tayle behinde. For this you must consider, that he that can by arte lay the hollow of the peece right against the marke, must needes hit it, so that it be not farther than the peece doth cast vpon the right line, for he that shall giue leuell to a peece without disparting, shall shoote a great deale ouer the marke, bycause that the side of the peece is contrarie vnto the coze or hollownesse of the same: for the mettall of the tayle of the peece, is a great deale thicker than the mouth. And furthermore, this is a very good way to disparte all manner of peeces of Ordnance: take your Calapar com-

D

passes

passes, and so take the height of the taylor of the peece, then measure it with your rule and looke what it is more at the taylor, than it is at the mouth, take halfe that for your disparte, and doing (as before is said) there is no truer way, so that your Calapar compasses be large ynough to reach it. Now in like case, you may disparte your peece with your Quadrant, and also with a square, but to teach tedious wayes as long as a man may teach easilie, it were but superfluous, and the easie wayes as good or better than the other.

Now, as concerning chambered peeces, for the dispar-ting of them, there can be no perfecte wryting, for it must be considered and handled, according vnto the forme of the Chamber, and fashion of the ball of the peece, whether it be Sling, Foller, Portpeece, or Baces: but any reasonable man, (when hee doth see the peece and the Chamber) may easily know what he must doe, as touching those matters.

How to giue leuell with any peece

*of Ordnance, to make a shotte, as the most sortes of
Gunners vse to doe, although there be
no Arte in it*

CHAPTER. 5.



Of the making of a shotte, that is to saye, to giue leuell vnto anye marke assigned, with a peece of Ordnance, without the right line, according vnto the accustomed manner that Gunners vse, for that they doe not knowe the distance vnto the marke, and therefore doe but giue a gesse

gesse what aduantage will reach the marke, and if that it be with an ynche rule, then thus they doe.

First by their iudgmentes they doe giue that so many ynches aduantage as they suppose will reach the marke, and then by the first lighting or falling of the shot, hee doth see whether it be shotte or gone ouer the marke, and if it be shotte, then at the next shooting hee will giue the peece moze aduantage by the ynche rule: and if it be ouer, then he will giue the peece lesse aduantage with the ynche rule: and so by diuers times shooting off the peece at a marke, they will finde howe many ynches and partes will keepe the length of the marke. And if they doe not shoote with an ynche rule, then they will giue the peece the aduantage by some assigned place beyonde the marke that they doe shoote at: and if the shotte doe light shorter, then they will giue the peece moze aduantage at the next shotte: and if the shotte be farther then the mark, then they will giue the peece lesse aduantage at the next shotte. And so by often shooting at the marke, they will hitte the length of the same, and then knowing at what marke the peece must be mounted vnto righte ouer the marke, then they alwayes mounte the peece vnto that aduantage, and they shall alwayes keepe the length of the marke, with that peece at that marke, the peece to be laden alwayes equally with Powder.

But by this order of shooting, hee shall neuer become cunning, although he shoote a thousand shottes, for that there is no methode or order in the doing thereof, but onely with that peece at the marke: for if you doe shoote with another peece at that marke, although the peece dothe shoote that shotte, and that weighte in Powder, the peece maye shoote vnder or ouer by the meanes of the length of the same, or the bignesse

or smalnesse of the breech, and the mouth of the peece in mettall. And to bring that peece vnto any other place, they must doe as at the first, to proue what will reach the marke: and therefore this kind of shooting is to no purpose, but onely in a Towne or Castell, in the time of seruice, for him that hath the charge of Ordnance, to proue what the peece will doe at euery marke, as touching the keeping of the length of the marke, whereby they may the better shoote at their enemies when they doe serue, otherwise it will be to no great purpose: for as often as you doe alter or chaunge your peece, or take that peece away to serue in an other place, so oft you are to seeke, and to proue the thinge newe againe, whether you doe vse to shoote with the ynnch rule, or by the degrees in the Quadrant: for if you doe shoote with the ynnch rule, then the length of the peece wil alter it as is shewed in the 8. chapter following. And if you shoote by the degrees in the Quadrant, then the highnesse or lownesse of the ground shall cause them to erre, as I doe shew in the thirteenth Chapter. Therefore, if I were worthy to giue counsell, I could shew them how to vse the matter, that they might attayne to know the length of the marke at the first shotte, but I neuer saw it so handled, whereby they should attaine it: for all the proofes that haue bene made as yet by Englishmen, are no prooffe, but altogether to cause them that did see the prooffe, to committe further error, as touching the distance vnto the marke, or hitting the length of the marke.

What

What a degree is &c.

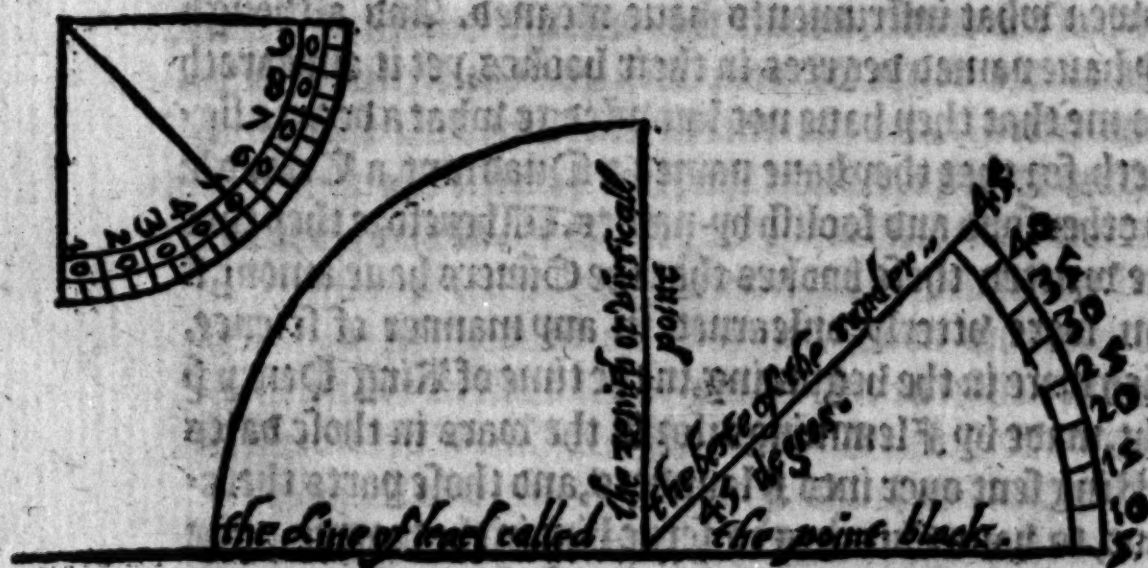
CHAPTER. 6.



Furthermoze, whereas this book is named
The Arte of shooting in great Ordnance, so in like manner I thinke it
conuenient, to shew you what the word
Arte meaneth or signifieth, which is,
the describing of a way or methode,
how to attayne to the certayntie of any matter. Which as
hitherto I haue not seen any such book, althogh it hath
been very neer two hundred yeeres since the first inuentio
of Ordnance: and excepte there bee any better booke in
some mens hands, such as I haue not seene, as it is like
ynough that there may be, there is no Arte in any of them:
yet I haue seene a number of bookes that haue bene
written concerning Ordnance, but surely they that wrote
the, were not seene in any part of y^e Mathematical science,
neither good Machanicians, but (in respect) utterly void
of any science: (in comparison) no good order described in
the shooting of Ordnance, to knowe what distance the
shotte is deliuered from the peece: neyther haue they
known what instruments haue meaned. And although
they haue named degrees in their bookes, yet it appeareth
vnto me that they haue not knowledge what a degree sig-
nifieth, for that they haue named a Quadrant, a Triangle
and other fond and foolish by-names. Wherefore they that
haue written those bookes that the Gunners haue amongst
them, were utterly vnlearned in any manner of science,
which were in the beginning, in the time of King Henry 8th
eight, made by Flemmings: for in the wars in those daies
the King sent ouer into Flaunders, and those parts there-
about, to haue Gunners to serue him in the warres, & the
Gunners haue no other bookes, but such as were written

by them: wherefore I do thinke it good to shew vnto you what a degree is.

A degree is a parte or deuision of a whole circle into 360. equall parts, as the the auncient fathers aforesaid haue taught, and especially in Astronomy. And it is very profitable for Gunners to knowe the vse of them. The Quadrant that they doe occupie, is the fourth part of a circle, deuided into 90. equall partes, according vnto the fourth part of the Heauens, for the Zeneth or pike in the Heauens (ouer the Crowne of your head, downe to the Horizon) is deuided into 90. equall partes, according vnto the Quadrant. As for example: If there were a perpendicular line let downe out of the Heauens vnto the earth, then should the earth be a right line, and make a square angle vnto the furthest parte of the Horizon that you can see, and so passe vnto the Heauens, as doth the Quadrant: and then the best of the Rader is 45. of these deuisions, called degrees (as some mens opinion hath been) and that is half 90. and the said. 45. degrees be the best of the Rader in some cases, and that is with the winde, but otherwise, it is not, as it is further declared in the 5. Chapter. And for better example, I haue placed this figure.



Howe to make a shotte vpon the

right line, and also to know how much

ground any peece of Ordnance doth drine

or conuey the shot at the mount of

euery degree of the Rander.

CHAPTER. 7.



Furthermore, any peece of Ordnance being truly disparted, as is declared in the fourth Chapter, they may know at al times how far to shoote iust vnto the mark, especially within point blank, & point blanke, is the direct fliccing of the

shot, without any descending from the mouth of the peece vnto the mark, & mouth of the peece to stand directly with the Horizon, so that it be vpon a plaine and leuell ground, as far as y^e peece may cast, hytting any thing that standeth directly as hygh as the mouth of the peece, laying the hollowe or concauitie of the peece against the thing that you doe shoote at &c. And to shoote at anye marke vppon the right line, you shall doe it by this meanes: your peece being truly disparted, and the dispart sette vppon the mouth of the peece, bringe the middle of the tayle of the peece to the toppe of your disparte vppon the mouth of the peece, and the marke that you doe shoote at, all three vppon one right line, by the sight of one of your eyes, and then foreseeing that the peece standeth vppon a leuell ground, and the one wheele to bee as nimble as the other, this doone, there is no doubt but you may shoote as nere the marke with a Cannon as with a Har- gabus, or Caliner. This is most certaine. Therefore it is very necessary to know how far any peece wil conuey the shot vpon the right line, & that is somewhat hard to do, for

D iiii.

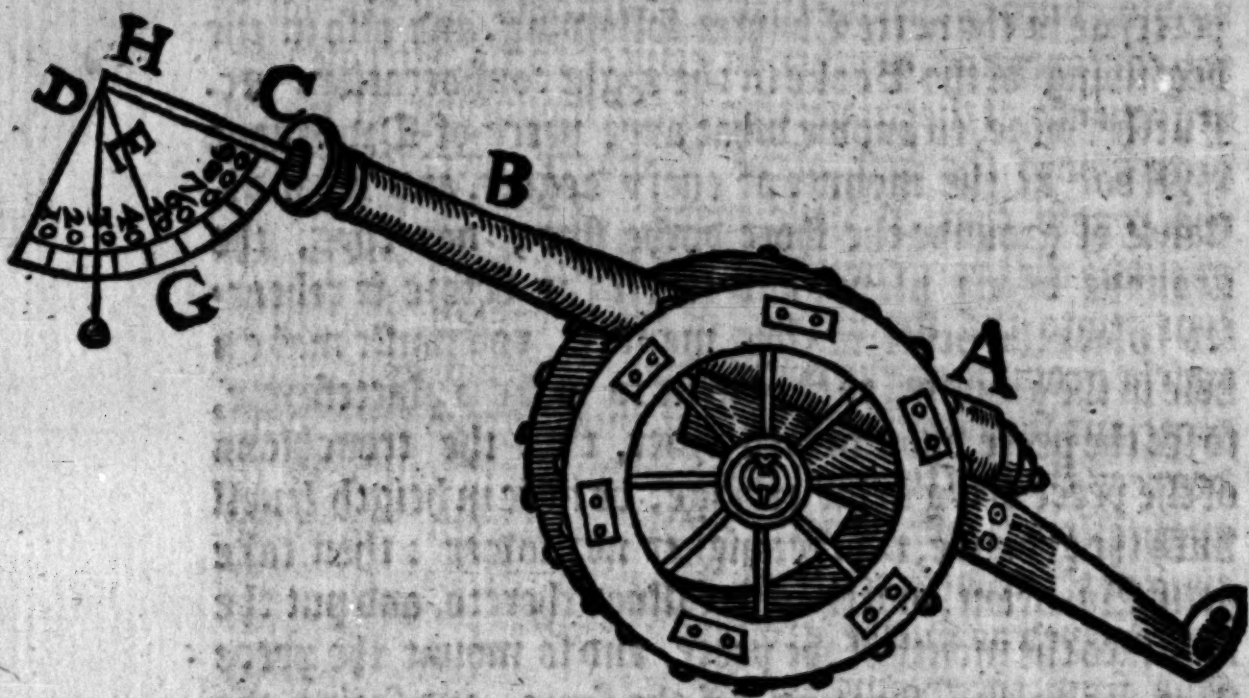
there

there is selwome any grounde, but is higher in one place than in another, and then if the peece should bee layd close vnto the ground, it woulde graze befoze that it were at the end of the right line, and then if the peece be in her carriage, the shotte will not graze befoze that it were descended, as much as the height of the carriage. And for to set vp any thing certaine at the end of the right line, it were too tedious, therefore in my opinion, this is one of the best wayes, in the finding what distance any peece conuayeth or driueth the shotte vppon the right line or any degree of the Rander, as thus: Repaire vnto a very leuell ground, as a plaine marish, that is iust water leuell, and then to finde the right line or point blanke, rayse a butte or banke in that plaine grounde, and then sette vppe a marke the iust height of the peece that lyeth in the carriage, and take a quadzant, with a rule fast therewnto, and put the rule into the mouth of the peece, and coyne the breech of the peece vp and downe, vntill the plummet hang at the corner of the Quadzant, and then shall the Concauitie of the peece, lye right with the Hozyzon, neyther higher nor lower: then shoote off the peece against the butte: if the shotte bee vnder the marke, it is moze then the right line, then you must brynge the peece neerer vnto the butte, banke or marke: but if it be the iust height of the marke, then remooue the peece farther off from the marke, and so remoouing the peece forwarde and backwardes, you shall finde the true right line of the peece. By this order, you may trye the true right line of all manner of peeces of Ordnance. And whereas the opinion of diuers Gunners is, the one contrarie vnto the other, some holding an opinion, that the longer peece doth overshoot the shorter, and some that the shorter doth overshoot the longer: the troth is, that the longer peece doth shoote further than the shorter, although that in the mounting of a long
peece

peece and a shoꝛte with an ynche rule, the shoꝛte peece
dothe ouershoote the longer, although bothe shoote one
shotte, and one soꝛte and weyght of powder, as you maye
perceyue in the nexte Chapter following, and also in the
beginning of the Booke in the eyght consideration. &c.
Furthermoze, to knowe what anye peece of Ordnance
wyl doe at the mount of euery degree, and what di-
stance of grounde the shot dothe flye, doe thys, the
grounde beyng playne and leuell (as before is rehear-
sed) place the peece in thys manner: you muste make a
hole in the grounde, to the intent to make a platteforme,
to set the peece vpon, in such order, that the tranchions
of the peece being in hir cariage, be iuste in heigth leuell
with the grounde, neyther higher nor lower: then take
your Quadrant, and the rule fastned thereto, and put the
rule into the mouth of the peece, and so mount the peece
vnto one degree, shooting off the same, and seeing the
firste grafe, measure the distance of grounde, and note
or marke that: then in like manner mount the peece vnto
two degrees, and so vnto thzee degrees, and so foꝛth from
degree to degree, vntill the peece bee mounted vnto the
best compasse of the Rander. Thus shall you know what
any peece will doe at the mount of euery degree. &c. But if
you shoulde make youre pꝛoofe vppon suche grounde as
is not leuell, then your pꝛoofe shoulde be erronious, foꝛ
that the Quadrant sheweth by the degree, howe muche it
is higher than the Horizon, foꝛ if the shotte doe not finde
grounde in his descending, equall with the heigth of the
peece, the shotte fleeth further than it shoulde do. And also
if the ground be higher than the place that the peece doth
stand vpon, then the shot will be stayde the sooner, by the
meanes of the heigth of the ground, as I do moze at large
declare in the. 13. Chapter following. And foꝛ your better
instruction of the mounting of the peece, I haue made this
figure following.

E

First



Firste take the Quadrant, and put the rule of the Qua-
drante B into the mouth of the peece C, and then putting
 vp or downe the tayle of the peece A, till the plummet
 G fall vpon the corner of the Quadrant at D, then looke
 whatsoeuer you see right with the vpper side of the Qua-
 drante H, shall be leuell with the mouth of the peece,
 and that is called the poyn^t blancke, for that vppon a le-
 uell grounde wythoute anye hylls, as vppon the sea, that
 all thinges standeth so leuell, shall bee ryghte wythe the
 Horizon, that is to say, at the parting of the earthe and
 the Skye, by the sighte of youre eye: and then puttyng
 downe the tayle of the peece A, the plummet line G wyll
 hange

hange at what degree you please towards the myddle
lyne of the Quadrant E, then the mouth of the peece B
and C wyll goe vpwartes. &c. Nowe shall followe (ac-
cording vnto the prooffe that I haue made, but yet not to
my contentation, neyther in respect to no purpose) the
argumente of the proportion of the mountyng of euerie
degree vnto the best of the Randare, according vnto
the prooffe that I haue made. Looke howe muche
grounde the peece conueyeth the shotte from the ryghte
lyne, vnto the mountyng of fyue degrees, that is as
muche grounde as the ryghte lyne, and two nynt parts
more, and from the mountyng of fyue degrees vnto tenne
degrees the shotte is conueyed as muche grounde as the
ryghte lyne, and $\frac{1}{2}$ parte more, and from the moun-
tyng of tenne degrees vnto fiftene degrees, the shotte
is conueyed as muche grounde as the ryghte lyne iuste.
And from the mounting of fiftene degrees vnto the
mountyng of twentye degrees, the shotte is conueyed
halfe as muche grounde as the ryghte lyne iust: and from
the mountyng of anye peece from twentye degrees vnto
the best of the Randare, the shotte is conueyed in all a-
bout $\frac{2}{3}$ partes of the ryghte lyne, and that is in a faire
calme daye, and then two and forty degrees is the beste
of the Randare, and wyth the wynde fyue and forty
is the best of the Randare, and agaynst the wynde, as the
wynde is in bignesse, that is, one and forty, or forty, or
nyne and thirty, or eyght and thirtie, or seauen and thir-
tye, or syxe and thirtie degrees, the wynde beeyng alto-
gyther the ruler therof. Therfore it is but a folly to make
accountp te thereof, neyther is there any seruice aboue the
mountyng of any peece of Ordnance, aboue .20. degrees,
excepte it be a mortar peece, and the shotte is conueyed
off grounde from the mouth of the peece vnto the ligh-
tyng or falling of the shotte, to the beste compassse

of the Rander, aboute five times and a halfe as muche
 gross as the right line, being (as before is declared) with-
 in a little vnder or ouer, according as the winde bloweth
 more or lesse, against the winde, or with the winde, and so
 forth. But here is one principall thinge to be considered,
 and that is this, that you do alwayes charge the peece w-
 ith iust one weighte, and one sorte and kinde of powder, for
 otherwayes, in the doyinge thereof, you may committe er-
 roure, as before is declared in the firste Chapter. As
 touching the knowing the goodnesse of Powder, for
 that it chanceth many times that they haue not alwayes
 one sorte of Powder, neyther alwayes of one mans making
 but of sundry mens making, and so by that meanes, some
 Powder is better than some is: therefore it is a harde mat-
 ter for to know certainly, y thus much in weight of this
 powder, is equall vnto the force of so muche in weighte of
 that sorte of Powder: wherefore in mine opinion, that en-
 gine or little bore that is deuised to proue the force of the
 Powder is verie necessarie to be vsed, for by it you maye
 iustly know which sorte of Powder is stronger or weaker
 in force than the other, by waying alike some small quan-
 titie of each sorte, and so putting the powder into the
 engine or bore, and burning it, firste the one sorte, and
 then the other sorte, and looke whiche sorte of Powder
 doth blowe, or lift the liide of the bore highest, that is the
 stronger sorte of powder, and you shall knowe by howe
 muche, by the teeth or notches that doe stay the liide of
 the engine or bore, and so by that engine or bore, you
 may fitte the force of the powder, that is to say, if that you
 doe occupye so muche powder with anye peece of Dye-
 nance. And for that you woulde keepe that length of the
 marke at suche an aduantage in mouncing, if you haue
 no more of that sorte of powder, but that the powder that
 you haue is eyther stronger or weaker, then do thus: wey
 out

out some smal quantitie, as the weight of a grote or pence, more or lesse at your discretion, as the engine or bore is, and firste burne that sorte of powder in the bore that you do knowe the force of it already, and then looke vnto what teeth or notch that the lidde of the engine or bore is lifted by vnto, and then wey out of the other sorte of powder the like weighte, and so burne that in the bore or engine, and if it dothe blowe or lifte the lydde hygher than it was before, then it is a stronger sorte of powder, if not so high, then it is a weaker sorte of powder: and by the number of notches, you shall know how much. Therefore, if it be a starger sorte of Powder than that you haue occupped already, then weye out a lesser weyghte of the same, and burne that in the bore or engine, and so doing, both by the weying and burning of it in the engine or bore, vntill that it lifte or blowe the lidde of the engine, vnto the iuste heygth that it was with the firste sorte of Powder: but if the firste sorte of Powder did blow or lifte the lydde higher than the other, then wey out more in weyghte than the firste, and so by the weying and burning of it in the engine, vntill the lydde be lifted vnto the iust heygth that it was before, so by that meanes you shall knowe iustely howe muche weyghte of one sorte of Powder shall be equall with the force of that sorte of Powder, and so by this meanes, although you change the sortes of your Powder neuer so often, yet you may so fitte the peece by the weyghte of your Powder, that the peece of Ordnance shall keepe one length at the marke. Having this consideration, both in the lading and the wadding, to be in such order, that is to say, to keepe a methode in the doing thereof, neyther to putte in the powder too harde, neyther too loose, neyther the wadde to goe in too loose, neyther to be too much too harde, but reasonable. And as touching the fashion and the making of the en-

gine or bore, I do omit that in this booke, for that I doe shew it in my Booke, called The Inventions or deuices, in the. 54. Deuice.

Howe for to mount any peece of
Ordnance by the degree with an
Inch rule, with a Table shewing what parte of
an ynche rule wyll make one degree, and
sa vnto tenne degrees.

CHAPTER. 8.



Do the making of a perfite shotte at any degree of the Randare, & to haue a good length at y^e marke, the distance of ground beeing knowne, first it behoueth him for to knowe the force of his Powder, whiche is shewed in the Chapter going before, and to haue his Powder putte in Cartredges, eyther of Paper or Canuas, and the Powder waied, that the one Cartredge bee not heauyer than the other, according vnto the peece, and the goodnesse of the Powder: for there can be no certaynetie when y^e the peece is laden or charged, sometime with more Powder, & sometime with lesse: and especially in the time of seruite, I do see, that there is no worse lading or charging of Ordnance, than with a Ladell, whether that it be by Sea or by lande, for by the lading with a Ladell, it muste bee twice filled, and then at every tyme that the Powder is putte into the peece, it muste bee put vppe with the Rammer heade, so that they muste eyther turne the other ende of the Ladell, or else if that the Rammer heade bee vppon the Spondge staffe, then he muste change the stauers, whiche
 is

is a greate cumber to doe in a narrowe roome. And also in the chargyng of a peece wyth a Ladell, hee cannot fill it so equally, but that the Ladell shall haue sometyme moze Powder, and sometyme lesse Powder, by a good quantity, and especially if that hee dothe it hastily as in the tyme of seruice it alwayes requireth haste, and that may cause hym that gyueth leuell, to shoote vnder or ouer the marke, or too shoote, or too farre, although y he hath found what aduantage wyll reach the marke.

And also it is vnprofitable and daungerous to lade or charge a peece wyth a Ladell, for that the Powder is apte to bee shedde or spylled beeyng hastily done, and then it is apte to bee fiered, considering what a daungerous poynte it is for the burning and spoyling of men.

Wherefore if youre Powder bee in Cartredges, and also weyed, the peece is moze sooner and easiler laden or charged, and hee shall keepe the length of the marke the better, and also you maye keepe the Powder the closer and better, and not so apte to bee shedde or spylled, for when that the Cartredges bee fylled, then they may bee set vprighte in some Tubbe or Barrell, and then they maye take out one by one as neede shall require, and so couer the Barrell close againe, that it maye bee wythout daunger.

And nowe for the gyuyng of leuell wyth anye peece of Ordnance, and the marke moze than the peece canne reache vppon the ryghte lyne, and the distance knowen vnto the marke, and also you knowing what ground the peece will conuey the shot vppon the right line, then by the order in the Chapter going before, you may know how many degrees will reach y mark. And for that it is somewhat tedious & difficulte to moue
any

any peece of Ordnance with a Quadrante, excepte it be
 upon a playne and leuell grounde, that the peece standeth
 no more, but the iuste heygth, or the lownesse of the mark,
 which happeneth very seldome. Therefore I doe thinke it
 very good to shew you howe to mount any peece of Or-
 nance by the degree, with an ynch rule, according to the
 length of the peece, and to knowe howe many ynches, and
 partes of an ynche will make or giue one degree vnto ten
 degrees. Hereafter is a Table, the length of the peece sta-
 deth in the margente towardes the lefte hande, & p square
 right againste, that is the mount of one degree, and the up-
 permost number in euery square, is the ynches, & the un-
 dermost numbers is the odde partes of an ynche, and the
 Table beginneth at the length of the peece five foote and
 a halfe, and so encreasech by the half foote, till the peece be
 full fifteene foote longe.

This

¶ This Table doth shew what part
of an ynach rule will make one degree,
and so vnto tenne degrees.

		Degrees.										
		1	2	3	4	5	6	7	8	9	10	
Foote 5. $\frac{1}{2}$ long.		1	2	3	4	5	6	7	9	10	11	Inches.
		$\frac{1}{22}$	$\frac{1}{11}$	$\frac{2}{22}$	$\frac{1}{11}$	$\frac{1}{22}$	$\frac{1}{11}$	$\frac{2}{22}$	$\frac{1}{11}$	$\frac{1}{22}$	$\frac{1}{11}$	Partes. Inches.
Foote 6. long.		1	2	3	5	6	7	8	10	11	12	Inches.
		$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$		$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$		$\frac{1}{4}$	$\frac{1}{2}$	Partes. Inches.
Foote 6. $\frac{1}{2}$ long.		1	2	4	5	6	8	9	10	12	13	Inches.
		$\frac{4}{11}$	$\frac{8}{11}$	$\frac{1}{11}$	$\frac{5}{11}$	$\frac{2}{11}$	$\frac{3}{11}$	$\frac{6}{11}$	$\frac{20}{11}$	$\frac{1}{11}$	$\frac{7}{11}$	Partes. Inches.
Foote 7. long.		1	2	4	5	7	8	10	11	13	14	Inches.
		$\frac{1}{11}$	$\frac{10}{11}$	$\frac{4}{11}$	$\frac{2}{11}$	$\frac{1}{11}$	$\frac{8}{11}$	$\frac{3}{11}$	$\frac{2}{11}$	$\frac{1}{11}$	$\frac{6}{11}$	Partes. Inches.
Foote 7. $\frac{1}{2}$ long.		1	3	4	6	7	9	10	12	13	15	Inches.
		$\frac{6}{11}$	$\frac{1}{11}$	$\frac{7}{11}$	$\frac{2}{11}$	$\frac{8}{11}$	$\frac{3}{11}$	$\frac{9}{11}$	$\frac{4}{11}$	$\frac{10}{11}$	$\frac{1}{11}$	Partes. Inches.
Foote 8. long.		1	3	5	6	8	10	11	13	15	16	Inches.
		$\frac{15}{22}$	$\frac{4}{11}$	$\frac{1}{22}$	$\frac{8}{11}$	$\frac{9}{22}$	$\frac{1}{11}$	$\frac{12}{22}$	$\frac{5}{11}$	$\frac{3}{22}$	$\frac{9}{11}$	Partes. Inches.
Foote 8. $\frac{1}{2}$ long.		1	3	5	7	8	10	12	14	15	17	Inches.
		$\frac{12}{22}$	$\frac{6}{11}$	$\frac{7}{22}$	$\frac{1}{11}$	$\frac{12}{22}$	$\frac{7}{11}$	$\frac{9}{22}$	$\frac{2}{11}$	$\frac{21}{22}$	$\frac{8}{11}$	Partes. Inches.
Foote 9. long.		1	3	5	7	9	11	13	15	17	19	Inches.
		$\frac{10}{11}$	$\frac{2}{11}$	$\frac{8}{11}$	$\frac{2}{11}$	$\frac{6}{11}$	$\frac{5}{11}$	$\frac{4}{11}$	$\frac{3}{11}$	$\frac{2}{11}$	$\frac{1}{11}$	Partes. Inches.
Foote 9. $\frac{1}{2}$ long.		2	4	6	8	10	12	14	16	18	20	Inches.

Foot. 10. long.	2	4	6	8	10	12	14	16	18	20	Inches.
	$\frac{1}{11}$	$\frac{2}{11}$	$\frac{3}{11}$	$\frac{4}{11}$	$\frac{5}{11}$	$\frac{6}{11}$	$\frac{7}{11}$	$\frac{8}{11}$	$\frac{9}{11}$	$\frac{10}{11}$	Partes. Inches.
Foot. 10. $\frac{1}{2}$ long.	2	4	6	8	10	13	15	17	19	21	Partes. Inches.
	$\frac{2}{11}$	$\frac{4}{11}$	$\frac{6}{11}$	$\frac{8}{11}$	$\frac{10}{11}$	$\frac{13}{11}$	$\frac{15}{11}$	$\frac{17}{11}$	$\frac{19}{11}$	$\frac{21}{11}$	
Foot. 11. long.	2	4	6	9	11	13	15	18	20	22	Partes. Inches.
	$\frac{3}{11}$	$\frac{6}{11}$	$\frac{9}{11}$	$\frac{11}{11}$	$\frac{4}{11}$	$\frac{7}{11}$	$\frac{10}{11}$	$\frac{13}{11}$	$\frac{16}{11}$	$\frac{19}{11}$	
Foot. 11. $\frac{1}{2}$ long.	2	4	7	9	12	14	16	19	21	24	Partes. Inches.
	$\frac{2}{11}$	$\frac{4}{11}$	$\frac{7}{11}$	$\frac{9}{11}$	$\frac{12}{11}$	$\frac{14}{11}$	$\frac{16}{11}$	$\frac{19}{11}$	$\frac{21}{11}$	$\frac{24}{11}$	
12.	2	5	7	10	12	15	17	20	22	25	Partes. Inches.
	$\frac{1}{2}$		$\frac{1}{2}$		$\frac{1}{2}$		$\frac{1}{2}$		$\frac{1}{2}$		
Foot. 12. $\frac{1}{2}$ long.	2	5	7	10	13	15	18	21	23	26	Partes. Inches.
	$\frac{7}{11}$	$\frac{11}{11}$	$\frac{10}{11}$	$\frac{6}{11}$	$\frac{2}{11}$	$\frac{2}{11}$	$\frac{5}{11}$	$\frac{1}{11}$	$\frac{8}{11}$	$\frac{4}{11}$	
Foot. 13. long.	2	5	8	10	13	16	19	21	24	27	Partes. Inches.
	$\frac{8}{11}$	$\frac{11}{11}$	$\frac{2}{11}$	$\frac{10}{11}$	$\frac{7}{11}$	$\frac{4}{11}$	$\frac{1}{11}$	$\frac{2}{11}$	$\frac{6}{11}$	$\frac{3}{11}$	
Foot. 13. $\frac{1}{2}$ long.	2	5	8	11	14	16	19	22	25	28	Partes. Inches.
	$\frac{9}{11}$	$\frac{7}{11}$	$\frac{5}{11}$	$\frac{11}{11}$	$\frac{1}{11}$	$\frac{10}{11}$	$\frac{8}{11}$	$\frac{6}{11}$	$\frac{4}{11}$	$\frac{2}{11}$	
Foot. 14. long.	2	5	8	11	14	17	20	23	26	29	Partes. Inches.
	$\frac{10}{11}$	$\frac{9}{11}$	$\frac{8}{11}$	$\frac{7}{11}$	$\frac{6}{11}$	$\frac{5}{11}$	$\frac{4}{11}$	$\frac{3}{11}$	$\frac{2}{11}$	$\frac{1}{11}$	
Foot. 14. $\frac{1}{2}$ long.	3	6	9	12	15	18	21	24	27	30	Partes. Inches.
	$\frac{1}{30}$	$\frac{1}{15}$	$\frac{1}{10}$	$\frac{2}{15}$	$\frac{1}{6}$	$\frac{1}{5}$	$\frac{2}{15}$	$\frac{1}{5}$	$\frac{2}{15}$	$\frac{1}{6}$	
Foot. 15. long.	3	6	9	12	15	18	21	25	28	31	Partes. Inches.
	$\frac{3}{22}$	$\frac{2}{11}$	$\frac{9}{22}$	$\frac{6}{11}$	$\frac{15}{22}$	$\frac{2}{11}$	$\frac{21}{22}$	$\frac{1}{11}$	$\frac{5}{22}$	$\frac{4}{11}$	

Then first repayre vnto the order of the Chapter that goeth before, and consider by the distance that the peece conueyeth the shotte vpon the right line, and looke howe much the shotte maye bee conueyed at the mount of one degree, and so from degree to degree, till you haue the length in degrees, that the shot maye reach the marke, and then repayre vnto the peece, and measure how many foote long the peece is, then according to the length of the peece, there is a Table in this Chapter going before, in the Margent of the which, towarde the left hand, that number is the length of the peece, then right against that number in the first square, it doth shew how many ynches, and partes of an ynche will make one degree: and the next square will shew you how many ynches, and partes of an ynch will make two degrees, and so forth vnto the number of tenne degrees, and no more: and the cause is this, for that there is commonly no seruice to be done, aboue the mounting of any peece of Ordnance, more then tenne degrees, neither the ynch rule will serue any further, for that the degrees be taken out of the circumference of a circle, and not out of a right line. And now to vse the matter in the handling of the rule, to make a perfite shot doe this: prepare your rule, and lette it be well deuised into ynches, halfe ynches, and quarters of ynches, and halfe quarters of ynches, and then lette there bee a slitte in the middle of the rule, and in the slitte, lette there bee made in brasse or latine a sighte, that it maye bee mooued vppe and downe at youre pleasure, and then the rule is finished. Nowe when you woulde make a shotte at anye marke, lette the peece bee truely disparted, and the disparte sette vppon the mouth of the peece, or else, if the disparte bee not sette vppon the mouth of the peece, yet you must knowe perfectly the Disparte of the peece, and to make accompte what num-

ber of ynches it is, and to reckon that as parte of the mounting of the peece by the degrees. Nowe the distance of ground being knowne vnto the marke, and also to knowe howe many ynches, and partes of an ynche wyll make the number of degrees, the accompte of the dispart being made, or else the dispart being set vpon the mouth of the peece, then set the rule vpon the breech of the same perfectly vpright, in such order, as the toppe of the rule bee not nearer vnto the mouth, than that place of the breech of the peece that the rule doth stand vppon, whether the peece haue much aduantage, or little, so that the toppe of the rule must not hang backwards or forwards, but alwayes at an proportion from the mouth of the peece: that being done, turne the peece right vnto the marke, and then koyne the breech of the peece vppre and downe, vntill the middle of the mouth of the peece, or else the toppe of the disparte, and the marke bee seene through the sight, in the slitte of the rule, iust at the number of ynches, and partes of an ynche, that will answere vnto so many degrees, as the Table in this Chapter going before doth shew. This being done, the shot shall haue a good length at the marke. As for example, suppose that I doe shoote in a Saker that conueyeth or driueth the shot vpon the right line or point blanche. 26. skore, and the marke that I doe shoote at is 40. skore from the peece, then I haue eyther made prooffe by the order prescribed in the. 7. Chapter that goeth before, or else I haue the Tables of some other men, as Tartalia y Italian hath made Tables therof And so I do finde, that. 2. degrees will reach the marke, then I do repaire vnto the peece and measure it, how many foote long the peece is, and I doe finde that the same is. 9. foote and a halfe in length from the mouth to the breech, then I repaire to y Table in this Chapter before, wher I find that. 2. ynches doth make a degree iust, and now the peece must

must be mounted vnto. 2. degrees iust, and then twise. 2. ynches, maketh. 4. ynches: then I do dispart the mettall of the peece, as I do shew you in the. 4. Chapter, and so I doe finde that the mettall of the breech of the peece is an ynche and a halfe thicker at the breech, than it is at the mouth of the peece, and then I doe sette vp a rush or a straw on the mouth of the peece, and so making it fast with a little ware iust one ynche and a halfe aboue the mettall of the mouth of the peece, then I doe take the ynce rule, and so I do remoue the sight in the slitte of the rule vnto iust. 4. ynches, and I doe set y rule perfectly vpright vpon the middle of the breech of the peece, and so remooue the peece too and fro, and koyne the tayle of the peece vp and downe, tyll such time as I may see the marke through the sight in the slitte, and the toppe of the dispart, all thre vpon one right line, by the sighte of my eye, and the sight in the slitte, to stand at iust. 4. ynches, then shooting off the peece, you shall make a perfite shotte. And furthermore, if the disparte bee not sette vpon the mouth of the peece, then you muste make accounte thereof, for that the peece dothe mount himselfe one ynche and a halfe, therefore you muste giue the peece but. 2. ynches & a half aduantage, to reach the marke. And furthermore, I will giue you a seconde example in the same peece at a greater distance, at. 80. skore fro the peece, and that is almost a mile, and then doing (as before is said) to seeke howe many degrees will reach the marke, and I find that peece that driueth or couateth the shot. 26. skore vpon the right line, that at. 9. degrees it wyll couey or driue the shot. 80. skore, and (as before is shewed) that in that peece that is. 9. foote and a halfe long. 2. ynches maketh iust one degree, and then the peece must be mounted vnto iust. 9. degrees, which is. 18. ynches, if the disparte be set vpon the mouth of the peece, but if the disparte bee not set vpon the mouth, then you must rebate so much of

the advantage in the mounting, as the disparte cometh unto, and that is one yuch and a halfe. Therefore, you must set the sight in the slitte, but vpon sixteene yuches and a halfe, and so doing (as before is said) the shot shall haue a good length at the mark. And furthermore, I had thought to haue placed a Table of proportion of the casting of the peece at the mouit of euery degree, accordingly as y^e peece doth conuey o^r diue the shotte vpon the right line, but that I haue not made any such exact prooofe, neither am I of that ability, neyther as farre as I can iudge, there is no man wil be at any such charge. But the exactest matter y^e I haue heard that Tartalia the Italian hath made perfit prooofe therof before diuers of the nobility of Italy, wher-vpon, he hath made Tables (by reporte) very exact, yet I could neuer come by the sighte of them, neyther are they in his Booke that he hath made for these causes.

What manner of course the shot

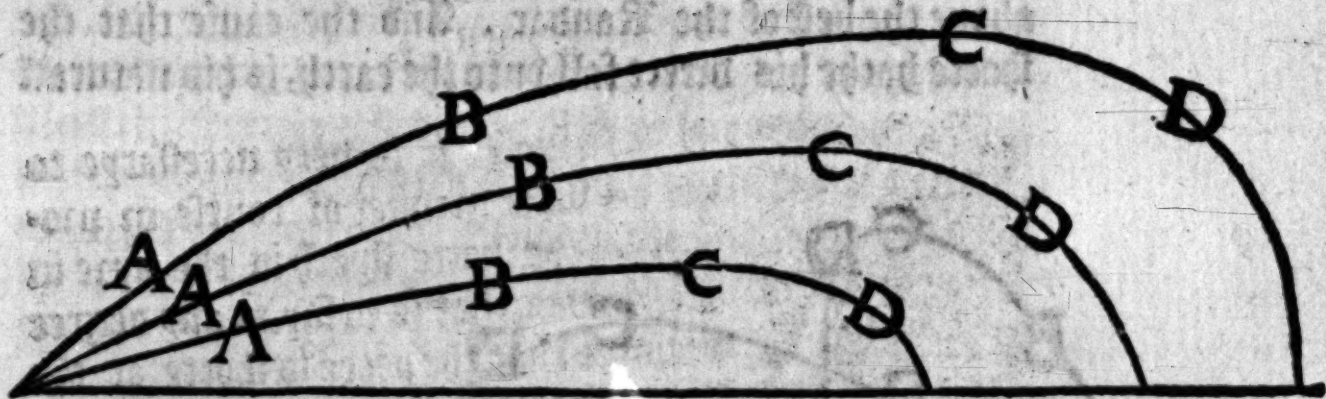
flyeth in the ayre.

CHAPTER. .9.



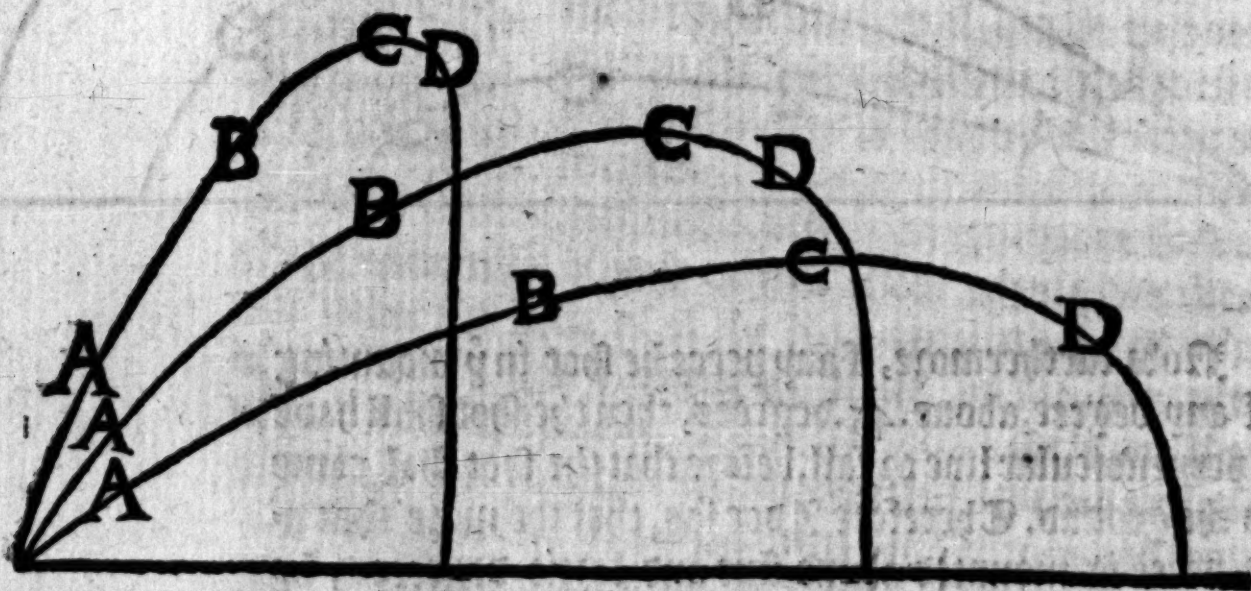
AS I suppose, it is very necessarye to knowe what manner of course o^r proportion the shotte flyeth in the ayre in his compas, that is to say, at any degree mounted that the peece is shotte at the Randare. All those peeces that be shotte at the mounting of anye degree aboue poynte blancke, and vnder the beste of of the Randare, hath. 4. manner of courses in hys d^ypyng o^r flying, by the vyolence of the blast of the powder, before the shotte come to the ground, so that the peece be shot against a leuelled groun. The first course is by a right line, and so long as the shot goeth violently. And the second course doth begin for to compasse, and yet flieth somewhat vpwards into the ayre, that

that is to say, further above the earth circularly. The third course is for a certayn space or quantitie at the highest distance from the earth. And the fourth course is, it cometh downwards circularly towards the earth, and so stouping more and more, till it cometh downe to the ground: as for example this: If any peece that is shotte at the best of the Randar, that is to say, at 45. degrees, and also at the mounting of thirtie degrees, and also at the mounting of fiftene degrees, and A signifieth the right line, and B the second course in flying of the shot circularly upwards, and C sheweth the vppermost course for flying at the farthest distance from the earth, and D sheweth the circular falling or coming downwards, or the stouping or falling more circularly, than any of the other courses or falling of the shotte, and the more neerer unto the ground, the more circularly the compasse is made, as this figure doth shew.



Now furthermore, if any peece be shot in \bar{p} mounting of any degree, above 45. degrees, then the shot shall haue a perpendicular line or fall, before that the shot shal come to the ground. Therefore I doe say, that the more that any peece is mounted above fūe and fortye degrees, by
the

the meanes of the perpendicular or falling, that the shotte falleth shorter and shorter at the mounting of euery degree: therefore they do neuer mount any manner of peece about the compasse of .45. degrees, except it be a shorter peece, and those be mounted alwaies about .45. degrees, for that the more the perpendicular line is, the more violently the shot commeth downe, and the more the peece is mounted, the higher into the ayre the shotte flyeth, and then the more is the perpendicular line, and the neerer vnto the peece the shot falleth. Therefore that mortar peece that is shot about .45. degrees, the shot hath .5. manner of courses, that is to say: first his right line vp into the ayre: secondly, his circular fleeting vp into the ayre: thirdly, his furthest distace from the earth: fourthly, his circular coming downe wardes: and fifthly, his direct fall or perpendicular line downe to the earth, as this figure may represent, the one line to be the best of the Randare, the other lyne to be the mounting of .15. degrees more than the beste of the Randar: and the third, the mounting of .30. degrees about the beste of the Randar. And the cause that the shotte hath his direct fall vnto the earth, is his naturall



course, for firste it is driven violently by the blast of the Powder up into the ayre by a right lyne, and then secondly, as the violent drift dothe decay, so it flyeth circularly, and thirdly, the force of the drift beeing all decayed, it muste needes haue bys naturall course, and all things that be of earthly substance, muste needes returne to the earth agayne.

How to mount a Morter peece
for to lay the shotte at any distance
appoynted.

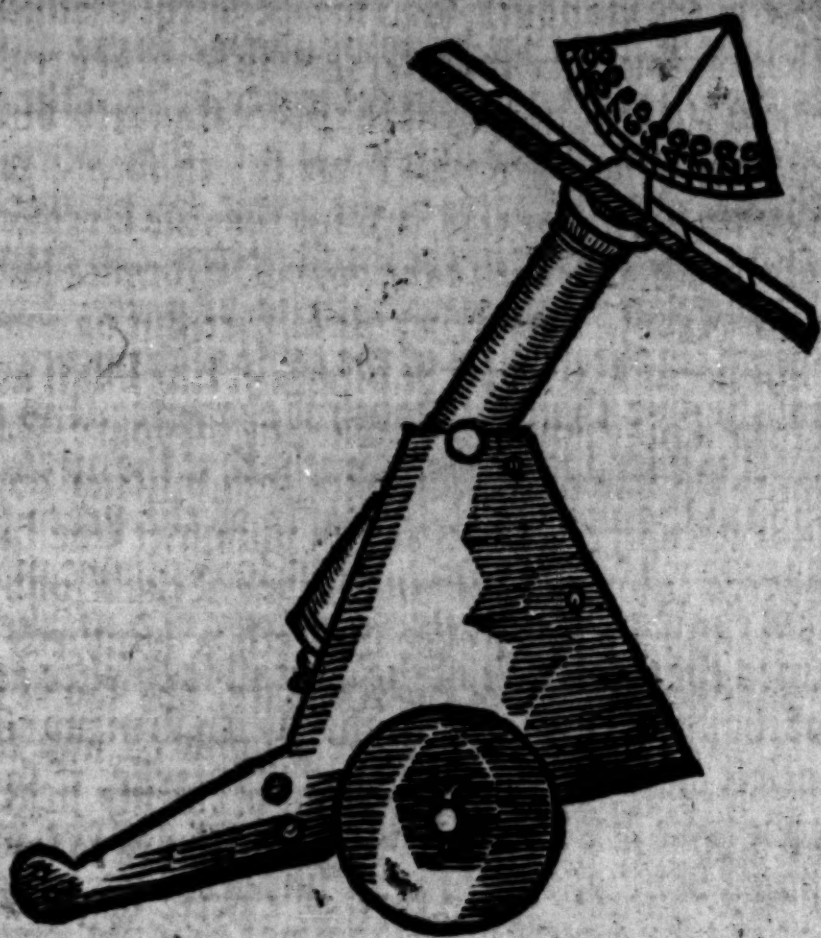
CHAPTER. 10.



Of the shooting of Morter peeces, it is to be considered, that those peeces must be mounted aboue the compasse of fīue and fortye degrees, for that these peeces are vled at the scege of Townes, for the annoyance of their enīemics, y is to say, to the intent to beat downe their lodgings or houses, with diueres other purposes more. And to haue the shotte to fall at any distance appoynted, they must do this: For euery degree that those peeces be mounted, the shot falleth shorter, as in the Chapter before is declared, & til y the mouth of the peece doth stande directly on your perpendicular line or Zeneth or picke, with the crowne of your head, and then the shotte shall fall directly into the mouth of the peece agayne, excepte that the accedence of the winde doth put it beside the mouth of the peece, as this: first shoote this peece at the mount of fīue and fortye degrees, that is the beste of the Randar, then measure the ground from the mouth of the peece vnto the first falling of the shotte, and y measure being knowen, deuide that into fīue and fortye equall parts, and euery one of these parts of measure, shal be the falling

falling shorter of the shot, at the mounting of one degree. As for example, a Morter peece, that shooteth a. 180. paces at the best of the Randare, shall shoot at the mounting of every degree foure pace shorter: and so from degree vnto degree, till that the mouth of the peece standeth directly vprighte with your Zeneth. Nowe for to shoot wth youre Morter peece, doe this: first lay the rule E crosse the mouth of the peece B, then take your Quadrante and set your square place G vppon the rule E, then put downe the tayle of the peece A, til that the plummet line F fall at the corner of the Quadrant C, then shooting off youre Morter peece that is the best of the Randare, and putting downe the tayle of the peece A, till that the plummet line fall at tenne degrees towardes the middle lyne of the Quadrant D then that Morter peece that shooteth a hundred and eyghtie paces at the best of the Randare, the shotte shall fall fortye pace shorter, that is, at a hundred and fortye pace from the peece, then at the mount of twenty degrees, the shotte shall fall 80. paces shorter, that is to say, at a hundred pace from the peece, then at thirtie degrees the shotte shall fall a hundred and twenty pace shorter, that is to say, threescore pace from the peece, then at the mounting of forty degrees, the shotte falleth at a hundred and threescore pace shorter, that is, at twentie pace from the peece. And thus it may be seen, that from the mounting of every degree the shot falleth shorter foure pace, and thus, by deviding the best of the Randare into five and fortye equal partes, you shal knowe the mount of every degree, at what distance the shotte shall fall from the peece, as by these figures following it doth appeare.

Howe



How farre about the marke the

*shotte flyeth over the marke by the length
of the peece, and distance vnto
the marke,*

CHAPTER. II.



Furthermore, heer is one especiall poynte
to bee noted, for a number of Sea Gun-
ners doe not vse for to diparte theyr
peece: and I doe thynk that a great nūber

of them can not doe it very well, for that cause they will say, y they neede not disparte their Ordnance. But if they do not disparte their great Ordnance, and especially those new peeces that be nowe adayes made for the Shippes, they shall do but simple seruice, besides the great charge in wast that they shall put them to that beare the charge thereof: for one shotte of the great Ordnance, is twenty times the charge of the small peeces: and many of the small peeces in a maner needeth no disparte, but the great peeces: for the mettall of the tayle of the peece is a great deale bigger than the mouth of the peece. And this is generall for euer, looke howe muche that the mettall is thicker vpon the one side at the tayle of the peece than it is at the mouth of the peece, then looke howe many times that the length of the peece is vnto the marke, so many times the thicknesse of the mettall is thicker at the breech of the peece, than it is at the mouth, so many times the quantitie shall the shotte flye ouer the marke, if so bee that the peece be shotte without disparting, and the mark within poynt blanke, or the righte line of the peece: as for example thus, by a peece of Ordnance, that the mettall of the breech of the peece is thicker by three ynches on the one side, than it is at the mouth of the peece, and the peece is iust tenn foote longe, and the marke is iust twenty skore from the peece. Nowe the peece being tenne foote long, there is iust sixe times the whole length of the peece in euery skore, for that a skore is sixtie foote, and sixe times tenne is sixtie foote, then the mettall of the breech of the peece, being three ynchs thicker than it is at the mouth of the peece, y peece shall cast ouer the marke at the ende of euery skore eyghtene ynches, for that the peece shooteth three ynches ouer the marke at euery tyme the length of the peece, and then syre tymes three ynches, maketh eyghteen ynches: so then it must needes be

he sayde, that at the ende of twentie skore, the peece must needes caste twentie tymes eyghtene ynches ouer the marke, and twenty tymes eyghtene ynches, maketh three hundred and sixtie ynches, and that containeth thyrtye foote, so that I doe conclude, that the peece whiche is but tenne foote long, and the mettall thre ynches thicker on the one side at the breeche of the peece than it is at the mouth, and the marke twenty skore from the peece, thys peece being shotte wythout anye disparting, being shotte agaynst an vpright wall, then bringing the middle of the mouth of the peece, and the myddle of the tayle of the peece, and the marke, all thre vppon one righte lyne, and then the shotte shall hytte the wall iuste thyrtye foot right ouer the marke, and this shall be true without anye faile. Then this being true, what madd men be those Gunners that will be of such an opinion, that they neede not to dispart their Ordnance.

Howe to make a perfite shotte
with a peece that is not truly bored, that
is to say, that the core or hollownesse
goeth not right in the middle
of the mettall.

CHAPTER. 12.



As it chanceth many times thorough negligence or default of Founders, that some peeces be not truly bored, is to say, that the core or hollownesse of the peece runneth not right in the middle of the mettall, but y^e core or concauitie declineth or leaneth more vnto the one side, than it dothe on the other, for although at the mouth of the peece the metal be round about of one like thicknesse, yet at the breech

of the peece the mettall may bee thicker on the one side, than it is on the other, and then that peece wyll neuer shoote righte vpon the marke: and also, this peece is very dangerous to shoote in for feare of breaking. And this is generally for euer. Looke at that side that the mettall is most thickest at the breech, from that sidewardes the peece doth cast, and then righte against the thickest parte of the peece, there is the thinnest side of the mettall, so that the mettall be perfit rounde on the outside of the peece, and also the hollowe & concauitie wythin the peece, and towards the thickest side of the mettall of the peece, towards that side the peece casteth. And for to knowe howe much, you may easily perceiue: looke how much the thickest side of the mettall is thpycker than the thynner side, looke howe many times the hollowe of the peece is vnto the marke, so many times halfe the thicknesse that y^e mettall is thicker on the one side, thā it is on the other, so many times that proportion shal the shot flye wide of the mark, towards that side that the mettall of the peece is most thickest. As for example this, there is a peece, y^e the mettall is thicker on the one side, than it is on the other side by two ynches, and the coze or hollownesse from the tutchhole, vnto the mouth of the peece, is .10. foote longe, and the marke that the peece is shot at, is 20. skoze from y^e peece: now there is .6. times the length of the hollownesse of the peece in euery skoze, and the peece casteth one ynche awyde at euery time the length of the hollow of the peece, for that the mettall is thicker on the one side, than it is on the other by .2. ynches, then take from the thicker side one ynch, and adde vnto the other side that one ynch, then it will set the hollownes of the peece right in the middle of the mettall, as it is .5. ynches thick on the thicker side, and but .3. ynches thicke on the thinner side, then take from .5. ynches one ynch, and there doth remain but .4. ynches, & then adde vnto .3. ynches one ynch, and then it maketh .4. ynches,

ynches, & then both the sides be of one like thicknes: then
(as before is said) there is .6. times the length of the hollow
nesse of the peece in every skore, so that the peece casteth
away in every skore, .6. ynches. The it must needes be said,
that at the ende of .20. skore, the peece casteth besides
the mark .20. times, .6. ynches, and it maketh .120. ynches,
and that is .10. foote iust. And furthermore, for to make a
perfit shot with this kinde of peece, it is a strange matter
vnto Gunners, and they had neede to be very circumspect
for feare of overcharging, for you must not giue this kinde
of peece powder according vnto the weyght of the mettall,
for that she hath too much mettall on the other side, wher
it doth noe good. And now for to make a shotte with this
kinde of peece, do this: first search the peece with those kinde
of instrumēts that I haue spokē of in the .2. Chapter, then
if the thickest part of the mettall be vpon the vpper side of
the peece, that is to saye, at the tutchhole, the peece be-
ing as before is declared .2. ynches thicker of mettall ther,
than it is on the lower side, when that you haue dispar-
ted youre peece truly, as though the hollownesse of the
peece ran right in the middle of the mettall, sette vp your
dispart vpon the mouth of the peece one ynch y more, for
that the mettall is thickest vpon the vpper side therof by .2.
ynches, and halfe .2. ynches is on ynche: then bringing
the middle of the tayle of the peece, and the top of youre
dispart, and the marke, all thre vpon one right line, by the
sight of your eye, the peece being shotte off you shall
make a perfit shot vpon the right line. Then if the thickest
part of the mettall by .2. ynches be vnder the peece, that is
to say, that at the tutchhole, the mettall is at the thinnest,
when you doe sette vp youre true disparte vpon the
mouthe of the peece, rebate one ynche of the lengthe
of the disparte, or else the peece will caste the shotte vnder
the marke, for that the thickest side of the mettall is
downewardeg. And furthermore, if that the thickest parte
of

of the mettall chāceth in any other place, howsoever that it chāceth, then at the thickest side of the peece make a little marke, as you may do it wyth a little ware as bygge as a pinnes head vpon the very breech of the peece: then when you haue disparted this peece truely, as though the hollownesse of the peece did runne right in the middle of the mettall, sett vp your disparte vpon the side of y^e mouth of the peece, as right as you can make it, with a line against the little ware that is on the thickest side on the breeche of the peece, and then make the dispart one ynche the more, for that it is y^e thicker side with mettall by two ynches, and then bying the toppe of the dispart and the little ware and the marke, all three vppon one right lyne, you shall make a perfite shotte. And furthermore, if that it chance so, that the thicker side doth lye somewhat vnderneath the peece, then set vp your dispart vpon the thinner side of the peece, and also the little wax vpon the breeche of the peece, and then you must rebate one ynch from your true disparte, and this by consideration, there can bee no peece, but that you may make a perfite shotte, for he that can by Arte lay the hollowe or concauitie of the peece against the marke, must needes hit the marke, so that the marke be not farther off than the peece can reach vppon the right line: and this is true without any fayne.

How to giue leuell at a marke vpon
a hill or valley, with the Quadrant.

CHAPTER. 13.



Of the shooting at a hill or valley to giue leuell with the Quadrant, there is two principall thinges to be considered, and especially, if that the marke be further than the peece will reach vppon the right lyne. First, when they doe knowe the distance vnto

unto the marke, and the marke moze than that the peece will reache vpon the right line, then mount the peece so many degrees, till that the peece be able to reache the marke, then take your Quadzant, and looke through the two sight of the Quadzant, the plummet hanging at libertie, till you may see the marke iustly vpon the byll, twinkling with one of your eyes, then looke vpon what degree and place the plummet line doth hang vpon, then mounte the peece so many degrees moze as that doeth come vnto, for the height of the hill, then that beeing done you shall make a perfecte shotte: as for example this: by a marke that stood vpon the side of an hill, and by Geometrie perspectiue, the distance is founde to bee sixtie skoze from the peece, and now the peece is a Culuering, such a one as shooteth thirtie skoze vpon the right line or point blanche. Now the marke is thirtie skoze moze then the peece can reach vpon the right line, therefore you must mount the peece, till it be able to reach the marke, and that is, at the mount of foure degrees, as it doth appeare by the examining of the seauenth Chapter, and there you shall finde it to appeare to be at the mount of foure degrees: now that being knowen, take your Quadzant, and take the number of degrees that the hill is in height, higher then the ground that you stand vpon, and that is done (as befoze is declared) and then you finde that the marke is five degrees higher than the ground that your peece lyeth vpon, then adde that number vnto the other, and that maketh in all nine degrees iust, for that the peece is moited foure degrees for to reach the marke, and five degrees for the height of the marke, whiche is higher ground than that the peece doth lye vpon, then laying the peece right vpon the marke, there is no doubt but that you must needes make a perfecte shotte, and to lay the peece right vpon the mark, the peece being mou-

ted (as before is said) then take a plummet of leade vpon a small line or string, and lette that be holden vp at the breech, at the very end of the peece, euen at the very middle of the taylor of the peece, then stand directly behind the peece, and wind the peece, till you doe see the middle of the mouth of the peece, and the marke, all thre vpon one right line, by the sight of your eye, winking with one of your eyes, and there is no doubt, but your peece doth lye right vpon your marke, and so forth. And now in like manner, if you doe make a shotte towards a valley, and the marke more then the peece will reach vpon the right line, then knowing the distance vnto the marke mount the peece, till it be able to reach the marke, then turne your Quadrant, that the sight go downewards, the plummet hanging at libertie, then you may see how many degrees the ground is lower, then the ground that the peece doth lye vpon, and rebate so many degrees as that number cometh vnto, and laying the peece right vpon the marke, there is no doubt but you shall make a perfite shotte, as by an example with that peece and at that distance before rehearsed, to a marke in a valley, the ground being lower at the marke you shoote at by three degrees, then that ground that the peece doth lye vpon; now you must mount the peece foure degrees to reach the marke, and then you must rebate three of those degrees for the lownesse of the marke; and then you may conclude, that the peece being mounted but one degree, it doth shoote that distance that it did at nine degrees. And the reason thereof is most manifest, for that the one is vp the hill, and the other downe the hill. And furthermore, with that peece, and at that distance before spoken of, and also at that number of degrees downe the hill that the other was vp the hill, that was at five degrees, & now foure degrees will reach the marke vpon a plaine leuell ground, but for
that

that it is downe the hill, you must rebate five degrees. Wherefore you may conclude, that the peece must bee leuelled with the Quadzant, one degree vnder the poynt blanke, that is to saye, lower then the Horizon by one degree, for that the deepenesse of the valley is the cause thereof. Wherefore in mine opinion, it is better for Gunners to vse to giue leuell with an ync rule, as I do afore declare in the eight Chapter, for I doe know, that this is the cause that hath deceiued a greate number that are meanly seene in those matters, and for lacke of considering of those causes that may happen or chaunce, hath discouraged many that would haue been wel seene in those matters.

Howe to make a perfite shotte vp-

*on the lande, at the brode side of a Shippe that
is vnder sayle, and
going.*

CHAPTER. 14.



Furthermore, for the making of a perfite shotte vpon the lande, at a shippe that is vnder sayle in a Riuer, the chiefest matter is, to haue good Powder, that the peece may goe off so soone as shee hath fire giuen vnto her: and to shoot at her brode side, doe this: First before she commeth to you, view at what proportion she commeth, that is to say, whether that she commeth in the middle, or vnto any of the sides, or vnto any other proportion, then your peeces beeing truely disparted, lay your peece against some marke vpon the further side of the Riuer, that being done, then koyne vp the tayle of the peece, till the top of the dispart standeth with that proportion which the ship commeth vpon: that
 being

being done, then it is good for you to haue another imagined marke, somewhat neerer the Shippe, besides that marke which the peece lyeth vpon, like a twentie foote, according vnto the way of the Shippe, for if that the Shippe haue fresh way, then giue fire vnto the peece or peeces, twentie or thirtie foote, before that the Shippe cometh vnto your thwart marke that the peece lyeth right against, and this being discretely done, there is no doubt but you shall make a perfect shot. And furthermore, if it be vpon the Sea coast, where there is no land scene vpon the further side, then take a thwart marke by some Cloud that is alow neere the Horizon. And furthermore, if that any shippe doe go directly from you wards, or else come directly to you wards, then it is a small matter to make a perfect shotte, that is to say, if that her head or sterne be towards your Ordnance. &c.

Howe to make a shotte out of one

*Ship vnto another, that although the Sea be wrought,
or out of a Galley to a Shippe.*

CHAPTER. 15.



S for Gunners that do serue by the Sea, must obserue this order following. First that they doe foresee that all their great Ordnance be fast breeched, and foresee that all ther geare be handsome and in a readinesse. And furthermore that they bee very circumspect about their Powder in the time of seruice, and especially beware of their Linestockes & candels for feare of their Powder, & their fireworks, & their Drum, which is very dangerous, and much to bee feared. Then furthermore, that you do keepe your peeces as neer as you can, dry within, and also, that you keep their tutch-
holes

holes cleane, without any kinde of dross falling into the. And furthermore, it is good for the Gunners to view their peeces, and for to know their perfect dispart, and marke it vpon the peece, or else in some Booke or Table, and name euery peece what it is, and where she doth lye in the ship, and name how many ynches, and half ynches and quarters of ynches the dispart comuneth vnto, and then in time of seruice, although that you haue no time to set vpp your disparte you may consider of it, and doe it well ynough. And furthermore, if that you were giuen to make a shot vpon a loddayne, and knowe not what disparte would serue the peece, yet this you may doe, and speede well ynough: first looke all alongst by the side of the peece as neere as you may at the middle of the breech of the peece, vnto the middle of the mouth of the peece, and so by the sight of your eye, lay it right against the marke, and then koyne vpon the taylor of your peece fast, for that giueth the peece the true height of the marke: then take the nexte sight aloft vpon the peece, from the breech of the peece, vnto the mouth, and so laye the peece right vpon the marke. But you would iudge by the sight of your eye, that the peece lye a great deale vnder the marke: for that the mettall of the peece is a greate deale thicker then the mettall of the mouth of the peece, and therefore the sight of the side of the peece, giueth her the true height of the marke, and then laying the peece right with the Ship that you doe meane to shoote at, looking well to your Steeradge. Nowe furthermore, if the Sea be wrought or growen, & the Shippes do both heaue and set, then if you would make a perfect shot, do this: First choose your peece between the Lauflaw, and the mayne Mast, vpon the lower Dloppe, if the Shippe may keepe the porte open, and for this cause you shal do it, for that the ship doth least labour there: for any Shippe that doth heaue, and set neuer

so soze, doth hang as though she were vppon an Ariltree, there labouring least, except she doth seel or roule. But if any Ship hang any thing by the wind, it will not lightly seel or roule. Then if you doe make a shotte at another Shippe, you must bee sure to haue a good helme-man, that can stirre steadie, taking some marke of a Cloude that is aboue by the Horizon or by the shadowe of the Sunne, or by your standing still, take some marke of the other shippe thzough some hole, or any such other like. Then he that giueth leuell, must obserue this: first consider what disparte his peece must haue, then laye the peece directly with that parte of the Shippe that he doth meane to shoote at: then if the Shippe bee vnder the lee side of your Shippe, shoote your peece in the comming downe of the Gayle, and the beginning of the other Ship to rise vpon the Sea, as neere as you can, for this cause, for when the other shippe is aloft vpon the Sea, and shee vnder your Lee, the Gayle maketh her for to head, and then it is likeliest to doe much good.

Now furthermore, if that the Shippe you doe shoote at haue the weather gage of you, then your peece that you doe shoote at her, must needes bee on the weather side of the Shippe: then giue fire vnto the peece in the righting of both the Shippes. When that the Gayle is ouer, you must awaite when the other Shippe doth beginne for to arise vpon the Sea, and especially that part of the Ship that you doe meane for to shoote at, for this cause, for when that the Gayle is ouer, then both the Shippes doe righte, for if that you should shoote in the helding of your Shippe, then you shoulde shoote ouer the other Shippe. And furthermore, if you shoote when the other Shippe is aloft on the toppe of the Sea, you haue a bigger marke than when she is in the trough of the Sea. Therefore there is no better time for to giue fire,

fire, then when shee is beginning to rise vpon the Sea, that is, when you see her in the trough of the Sea: and you must vse that according vnto the distance betweene two Shippes, for you must consider, that the shotte must haue a time for to come to the shippe, for no man can describe the thing so well, as hee that doth see the thing apparante before his eyes, for his reason in those causes must helpe him, and the principallest thing is that, that hee that is at the Helme must bee sure to stirre steadye, and bee ruled by him that giueth the leuell, and hee that giueth fire, must bee nimble, and readye at a suddayne. And also hee that is at the Helme, must bee nimble and steady, that is, to putte roomer, when that the other Shippe dothe putte roomer, and for to loose, when that the other Shippe doeth plye his loose. And it is good for the Gunner to koyne the mouth of his peece, somewhat with the lowest, rather then any thing with the hyghest, for if that the shotte flyeth ouer the Shippe, then it dothe no good, but if that it commeth shorke of the Shipoe, it will graze in the water and rise a-gayne, and speede well ynough, so that it bee not too muche too shorke of the Shippe, for too muche too shorke dothe kill the shotte in the Sea and especial-lye if that the distance bee anye thing farre off. And furthermoze, for the Sea fight, if the one doe meane to lay the other aboord, then they doe call by their company, eyther for to enter or to defend: and first, if that they doe meane for to enter (as you may knowe) that hee will please to laye you aboord, then marke where that you doe see anye Scottles for to come vppe at, as they will stande neere there aboutes, to the intente for to bee readie, for to come vppe vnder the Scottles: there giue leuell with your Fowlers, or Slinges, or Bales, for there you shall bee sure to doe

most good, then furthermore, if you doe meane for to enter him, then giue leuel with your Fowlers and Portpeeces, where you doe see his chiefest sight of his Shippe is, and especially be sure to haue them charged, and to shoote, them off at the first boording of the Shippes, for then you shall be sure to speede. And furthermore, marke where his men haue most recourse, there discharge your Fowlers and Bales. And furthermore, for the annoyance of your enemye, if that at the boording that the Shippes lye, therefore you may take away their steeradge with one of your great peeces that is to shoote at his Rother, and furthermore at his mayne mast, and so forth. Thus muche haue I said as touching Sea Gunners, for that I doe know they do meddle with no other sightes, and therefore it is meete for him to seeke as much as in him lyeth, for to annoy the enemye with fireworkes and Ordnance &c. And furthermore, if the Shippe doth seell or rowle, then the best place of the ship for to make a shotte, is out of the head or sterne. And furthermore, for to make a shot out of a Galley, and especially the Cannon that lyeth in the Case, or Prow, he that giueth fire, must be ruled by him that is at the helme, because he can neyther koyne her vp nor downe, for that she lyeth in the case, for he that stirreth, must giue leuell. And furthermore, the Cannon that lyeth in the case, can not lightly shoote a shippe vnder water, neither betweene the wind and the water, where that it is not on the Sea, and especially if the Ship be at hand, for that she lyeth leuell, for looke how high, that the peece is aboue the Sea, so high shall the shotte hitte any thing aboue the water, as farre as the peece can cast vppon the right line. And for to make a shotte out of a Galley vnto a Shippe, for to strike him vnder the water, or betweene the wind and the water. First waight the Shippe lying in the trough of the Sea, when she doth begin to rise vppon the

the Sea, and then in lyke manner, when you do see that the Galleys head doth beginne to descende, then giue fire vnto the peece, and you shall make a perfitte shotte. Furthermore, if the Galley be in fight with another Shyppe in a calme, then the Shyppe will skant waue or stirre, and then the Galley may play off and on at hir pleasure: and then to make a shotte at hande, is some matter, for in a calme the Shyppes doe neither ryle nor fall, but a little, in comparison of any thing to the purpose: neyther dothe the Galleys head either heaue nor set to any purpose, if the Shippe be at hand, to the intent or purpose to shoote a Shippe vnder the water. Therefore when you meane to strike a Shippe vnder the water with a Galley, and dare not lay them aboord, then kyle your Cabels forwarde, with the trimming forwarde of your waightie geare into the Galleys head, so lowe, till it shall serue your turne, by bringing also your men forwarde: then by y^e Steeradge with your Dyes, or with your Helme, you may shoote against what part of the Shippe you will, and so shoote hir vnder water at your pleasure.

In what order to place Ordnance in Shippes.

CHAPTER. 16.



And furthermore, I do think it conueniente to shew you how to sit or place Ordnance in any Shippe: & this is to be considered, first that y^e cariage be made in such sort, that y^e peece may lie right in the middle of the port, & that the trockes or wheelles be not too hygh, for if y^e treekes be too high, then it will keepe the cariage that it will not goe close vnto the Shippes side, and by that meanes the

I

peece

peece will not scant go out of the porte, excepte that the peece be of some reasonable length: and also, if that the Shyppe doe holde that waye, the Trockes will alwayes rûne close to the Shyppes side, so that if you haue any occasion to make a shotte, you shall not bring the Trockes off from the Shyppes side, but that it will rûne too again. And the wheele of Trocke beyng very hygh, it is not a small thinge vnder a Trocke wyl stay it but that it may runne ouer it, &c.

And also, if that the Trocke be hygh, it wyl cause the peece to haue the greater reuerse or recople, therefore, the lower that the wheeles of Trockes be, it is the better and so forth.

Alwayes prouided, that the peece bee placed in the very middle of the porte, that is to saye, that the peece lying leuell at poynte blanke, and the Shyppe, to bee vprighte, wthout anye helding, that it be as many inches from the lower syde of the porte beneath, as it is vnto the vpper part about iustely. And the deeper or hygher that the portes bee vp and downe, it is the better to make a shot, for the helpyng of the Shyppe, whether that it bee the lee syde, or the weather syde of the Shyppe, for if you haue anye occasion to shoote eyther forwarde or backwards, the steeradge of the Shyppe wyl serue the turne, but if that the Shyppe dothe heelde muche, then if that the peece bee lette by the lower parte of the porte, then you muste needes shoote ouer the marke, and if it bee lette by the vpper syde of the porte, then you shall shoote shorte of the marke. &c. Therefore, when that the Carpenters dothe cutte out anye portes in a Shippe, then lette them cutte them out deepe ynough vpper and downe. &c.

And also, it is verie euyl, for to haue the Dylippe
or

or Decke too lowe vnder the porte, for then the carriage muste bee made verpe hygh, and that is verpe euill in dyuers respectes, for then in the shooting off the peece, it is apte to ouerthrowe, and also by the labouring and the seelyng of the Shyppe, and so forth.

And furthermore, you muste haue a consydera- tion for the fytting of youre Ordnance in the Shippes, as thys, the shorter Ordnance is beste to bee placed out at the Shippes syde, for two or thre causes, as this.

Fyrst, for the ease of the Shyppe, for theyr short- nesse they are the lyghter: and also, if that the Shyppes shoulde heelde wyth the bearyng of a Sayle, that you muste shutte the portes, especially if that the Ordnance bee vppon the lower Dloppe, and then the shorter peece is the easier to bee taken in, both for the shortenesse and the weyght also.

In lyke manner, the shorter that the peece ly- eth oute of the shyppes syde, the lesse it shall an- noy them in the tacklyng of the Shyppes Sayles, for if that the peece doe lye verpe farre oute of the Shyppes syde, then the Sheetes and Tackes, or the Bolynes wyll alwayes bee foule of the Ordnance, whereby it maye muche annoy them in foule weather, and so forth.

And it is verpe good for you to haue long Ordnance to bee placed righte oute of the Sterne of the Shyppe for two causes: the one is this.

The peece muste lye verpe farre oute of the porte, or else in the shooting, it may blowe vpon the Counter of the Shyppes sterne.

And also, the peece had neede be very large, for else it

will not go very farre out, for the wayke of a ships sterne hangeth very farre outwards from the decke or Dylappe by to the porte, so that the carriage may be close belowe, but not aloft, &c. And also if you haue any chaling peeces to shoote right forwarde, then they must bee long Ordnance in like manner, so that you must fitte your Ordnance, according vnto the place that it must lye in, and also (as is before rehearsed) that it is not good for to haue the mountance or carredge too high. Therefore, if that the Dylappe or decke bee too lowe vnder the porte, then it is good for you to make a platfome vnder the porte, that the trockes of the carredge may stand vpon. And also, when you doe take the measure of the porte, from the decke or Dylappe, to the end to fitte the mountance or carredge in height, that the peece may lye right in the middle of the porte, then you viewing the decke or Dylap, and considering what height you will haue the wheele or Trocke, and also marke whether or how that the Ships side doth hang inwards, or outwards, and also the Cambering of the decke or Dylappe, and then you perceiving where the foremost trockes doth or must stande, when that the carredge doth go close to the porte. Then where as the very middle of the foremost trockes dothe stande, there take the true measure in heygth from the Decke or Dylappe, vpwards, and so shall you knowe iustly howe many ynches will laye the peece righte in the very middle of the porte: for if you doe take the measure of the heygth of the porte from the porte downe vnto the Decke or Dylappe, then by the meanes of the Cambering, the Decke or Dylappe, and also the wheeles or Trockes doth not come to stand right vnder the porte, so by that meanes the Decke or Dylap is higher inwards, and that shal cause you to make the mountance or carriage too high, for that the wheeles or Trockes that the carriage lyeth vpon, shall be a foote more

more or lesse into the Shipwards, and then looke into the Cambering of the Decke or Dyloppe, that it riseth inwardes more, than it is righte vnder the Pozte, you shall take the measure so much too high for the peece to lay her right in the middle of the Pozte &c.

How to shoot at a moueable mark

*upon the lande, and also what kind of shotte is
the best to be vsed, according vnto
the cause &c.*

CHAPTER. 17.



And furthermore, to shoothe at any moueable marke vpon the land, either at Horsemen, or at footmen. when you do see the coming, then place your Ordnance vpon some marke in their way, as right vpon some bush, or any other marke that is in the high way, that they must come by, or most specially at some place where there is a turning, for in a turning, there they doe tarrie longest before they be altered from the marke, and then it is best shooting off your Ordnance to do any spoyle: and also vpon the land, you may try what any peece will do at any marke, as touching the keeping of the length of the marke, &c. And furthermore, as touching this, to knowe what kind of shotte is most meetest to be vsed to doe seruice in a field, or otherwise, with their great Ordnance, as Cannons, or Culuerings, at a great distance, to shoothe the whole yron shot as you doe at battery, & as they doe approach neere, then to shoothe Falcon shotte, and as they doe come neerer, Falconet shotte, or small base shotte, and at hand all manner of spoyling shot, as chayne shotte, or cliue shot, and dise shot, and such other like, &c.

How you shal knowe if any peece
 of Ordnance bee sufficiently mettalled, and
*also the cause that the Cannons doe not occu-
 pie the weight in Powder that the
 shotte vveieth.*

CHAPTER. 18.



Do to knowe whether that any peece
 of Ordnance bee sufficiently metal-
 led to beare her charge with Powder,
 then this is generall, that in the cham-
 ber before the tutchhole, so farre as the
 Powder doth reach to y^e mouthwards,
 that the mettall be in thickeesse as high as the shot round
 about the sides of the peece, and somewhat thicker, and if
 that the mettall be not in thickeesse as much as the height
 of the shotte, then she is too slenderly mettalled, &c.

And furthermore, the cause why the Cannons and o-
 ther great Ordnance doth not shoote so much Powder in
 weight as the shotte weieth, although that the rule and
 order of the founders of Ordnance, is to cast the thiknes
 of the mettall as much as the shotte is in height of al sortes
 of peeces, as wel in Cannons, as in al other sortes of pee-
 ces, and yet the Cannon maye not haue the weight in
 Powder that the shotte weyeth, as all small Ordnance
 hath.

And furthermore, the cause thereof groweth by this
 meanes, for in the doubling the thickeesse of the met-
 tall of the peece, it doth but increafe as a platforme, or
 superficiall, that is, for double measure, to be foure times
 the quantitie. And as for the shotte in the doubling of the
 measure, it is eight times the quantitie, and so it is in all
 bodyes

bodies as Tubes, or Globes, and such other like, as I do
more at large declare in the third part of my booke, called
A treasure for Travellers. And yet you shall haue this
example here by a shotte of three ynches high, and that
shot wayeth three pound three quarters, the peece being
a Minion, and the metall is three ynches thick. And now
I haue another peece that the shotte is double the height,
that is, sixe ynches high, and the shotte will wey thirtye
pounde, and now the mettall being double, is but sixe yn-
ches thicke, and the bigger shotte is eyght times the big-
nesse of the lesser, and the measure but double, yet not-
withstanding, the diuersitie is not so much as it seemeth:
for if that both the peeces were cast of one length, and
double in measure, in compasse in all places, then the big-
ger peece should wey foure times the weight of the lesser.
And this is the cause, that the Cannons must not haue the
weight in powder that the shotte wayeth, for the weight of
the peece, and the weight of the shotte, must rule the mat-
ter, as I doe plainly shewe in the third Chapter of this
booke going before.

In

In what order you shall giue

leuell with your Ordnance at
*a batterie, to beate downe the walles of
 any place, and also what to ob-
 serve, in the giuing fire
 vnto them.*

CHAPTER. 19.



S I doe think, it is not vnnecessary to shew
 by what order you shall giue your leuel,
 and shoote off your Ordnance at a Bat-
 terie, that is to saie, to beate downe, or
 shake downe the walles of any Towne
 or fortreffe: & for y^e beating them downe
 in the giuing of your leuell, and shooting them off, do this:
 after that you haue placed your Ordnance, eyther in two
 places or in three places, as the place doth require, but in
 my opinion, two places is sufficient vnto one place, to beat it
 downe, to the intent to make a breach, and if it be vnto a
 Collion point, then it is best to place your battrey but in-
 to two partes, and otherwise as the place doth require, &
 then in giuing of leuel, do this. First, wheras you do mean
 to beginne to make the breach, and being but at one place
 of your Ordnance, giue leuell with one peece belowe, at
 the bottome of the wall, and with the next peece a foote
 higher right ouer that, and with the third, right a foote ouer
 that, and so forth vnto euery peece at that part of y^e bat-
 tery, sauing you neede not giue the leuell vnto no peece,
 more than three quarters the heygth of the wall, and then
 in like maner, giue your leuell with your peeces at the o-
 ther parte of youre batterie, vnto that place that the other
 part was layd right against, within a fadome or more, at
 youre discretion, as the place requireth, so that the one
 place

place may flanke or beate against the other, crossing in the middle of the wall, and when you doe meane to shoote them off, then giue fire vnto them all at once at both the places, that they may all beate and shake the wall at one time together, and then it will beate it downe or shake it downe the faster, and the bottome being beaten away, the toppe will fall away of it selfe, and so when that you haue broken the wall, and stil do make it wider, then giue leuel at your discretion vpon the wall, obseruing the order before rehearsed, both in the leuelling, and of the giuing of fire vnto the peeces, &c.

The weight of all manner of cast

peeces of Ordnance, from the Cannon, vnto the Fauconete, and also the weight of the shotte, and the weight of the Powder that they doe occupie, with the height of the shot, and length of the peece and all such other like causes, according vnto the names of the peeces, &c.

CHAPTER. 20



And furthermore, I do thinke it conuenient, to shew vnto thee the weight of the shot, and the weight of the Powder that they doe wey, and the length and breadth of the Ladel, and the weight and length of y^e peeces, according vnto their names.

And first, for the Canons, & there be of sundrie sortes. The eldest & biggest sorte of the double Canons, the mouth of them is in height. 8. ynches and a quarter. The shot is in height 8. ynches, and wayeth about 70. pound of yron, and the weight of the peece is about 8000. & in length, about 12. foote more or lesse, and comports in Powder. 46. pound Serpentine. The length of the Ladel is 24. ynches,

the

the

the breadth of the Ladell is. 15. ynches $\frac{1}{2}$ &c.

The ordinarie double Cannons, the peece is. 8. ynches high in the mouth, the shotte is in heighth. 7. ynches three quarters, it wayeth of yron about. 64. pounce, and the weight of the peece is about. 7500. and in length neere about eleuen or twelue foote long, and occupieth in Powder. 42. pounce Serpentine, the length of the Ladell is 23. ynches a quarter, the breadth thereof fifteene ynches $\frac{1}{2}$ and the compasse of the shotte is foure and twentie ynches.

The French double Canons, the peece is in the mouth seauen ynches three quarters, in heighth the shotte seauen ynches $\frac{1}{2}$ high, and weyeth being of yron about. 58. pound, and the peece weyeth about seauen thousande, and is in length as the other before rehearsed, composeth in Powder neere fortie pounce Serpentine: the length of their Ladels is but fifteene ynches, for that they doe lade their peeces with three Ladelfulles, and we heere in England but with two, and the bredth of the plate of their Ladell is fifteene ynches, &c.

Demy Cannons.

And first the Demy Cannons of the eldest sorte, the peece is sixe ynches three quarters in heighth, in the mouth, the shotte sixe ynches and a halfe in heighth: the shotte of yron wayeth eight and thirtie pound, and the weight of the peece is neere sixe thousande, and in length eleuen or twelue foote long, and occupieth in Powder sixe and twentie pounce Serpentine, the length of the Ladell three and twentie ynches, the breadth of the plate of the Ladell twelue ynches $\frac{1}{2}$ partes, and the compasse of the shotte is twentie ynches $\frac{1}{2}$ partes.

The

The ordinary Demy Cannon, the height of the mouth is six ynches and a halfe, the height of the shotte six ynches a quarter, the weight of the shotte is yron thirtie three pounde, and the weight of the peece is about 5500. and the peece is in length tenne or eleuen foote, and her charge in Powder is foure and twentie pounde Serpentine, the length of the Ladell is two and twentie ynches, and the breadth of the plate of the Ladell is twelue ynches.

Some sortes of Demy Cannons, the height of the mouth of the peece but six ynches, a quarter, the height of the shotte six ynches, the weight of the shotte of yron thirtie pound, and the weight of the peece five thousand, or 5400. the length as afoze, her charge in Powder foure and twentie pounde Serpentine, the length of the Ladell three and twentie ynches, the breadth eleuen inches and a halfe.

The French Demy Cannon, and of some other foraine Nations, the height of the mouth of the peece but 6. ynches, the height of the shotte five ynches three quarters, the weyght of the yron shotte six and twentie pounde. and the weight of the peeces five thousande more or lesse, their lengthes of the ordinarie sort, and shooteth in Powder two and twentie, or three & twenty pound Serpentine, the length of the Ladell sixteene ynches, and three Ladell fulles to charge the peece: the breadth of the Ladell eleuen ynches.

Culuerings.

The elder sorte of whole Culuerings, called of some Norborow Culuerings, the height of the mouth of the peece five ynches and a halfe, the height of the

R ii.

shotte

shot. 5. ynches a quarter. The weyght of the shotte in yron 20. pound. The weyghte of the peece. 4800. more or lesse, their lengthes deuider, as. 12. or. 13. foote long, and shooteth in Powder. 20. pound Serpentine, the length of the Ladell. 23. ynches, the breadth of the Ladell neere tenne ynches. &c.

The ordinarie whole Culuering, the heygth of the mouth of the peece. 5. ynches a quarter, the heygth of the shotte, 5. ynches. The weyghte of the shotte of yron. 17. pounde. The weyghte of the peece aboute. 4500. more or lesse, the length of the peece. 12. foote, and composeth in Powder. 18. pounde Serpentine, the length of the Ladell 25. ynches, the breadth 9. ynches. &c.

Culuerings, not so high as ordinarie, the heygth of the mouth of the peece. 5. ynches, the heygth of the shotte foure ynches three quarters, the weyghte of the shot. 15. pounde, the weyght of the peece more or lesse. 4300. the length of the peeces diuers, some the ordinarie length, some otherwise, and occuppeth in Powder. 16. pound, or therabouts Serpentine, the length of the Ladell. 24. ynches, the breadth 9. ynches.

Demy Culuerings.

The elder sort of Demy Culuerings, the heigth of the mouth of the peece. 4. ynches three quarters, the heigth of the shot. 4. ynches $\frac{1}{2}$, the weyghte of the shotte. 12. lb. v. of yron, the weyght of the peece. 3200. the length of the peece. 12. foote more or lesse, and their charge in Powder 12. pound Serpentine, the length of the Ladell, 22. ynches, their breadth. 8. ynches. &c.

The ordinarie Demy Culuering, the heygth of the mouth of the peece. 4. ynches v. the heygth of the shotte 4. ynches a quarter, the weyght of yron shotte. 10. pound, three quarters, the weighte of the peece. 27. hundred or there.

thereabouts, the length of the peece. 10. foote more or lesse, and will composit in Powder. 11. or. 12. pounce Serpentine, the length of the Ladell. 21. ynches a quarter, the breadth. 8. ynches.

Demy Culuerings lower than ordinarie, the heygth of the mouth of the peece. 4. ynches a quarter, the heygth of the shot. 4. ynches, the weygth of the shotte being of yron is neere. 9. pounce, the weygth of the peeces. 22. hundred more or lesse, the length of the peece. 9. or. 10. foote more or lesse, and their charge in Powder. 10. pounce or. 10. pounce. Serpentine, the length of the Ladell. 20. ynches, the breadth. 7. ynches, three quarters. &c.

Sakers.

Sakers of the oldest sorte, the heygth of the mouth of the peece. 4. ynches, the heygth of the shot. 3. ynches three quarters, the weygth of the yron shotte. 7. pounce a quarter, the weygth of the peece. 1800. the length of some of those peeces. 10. foot, and compositeth in Powder. 7. pounce a quarter Serpentine, the length of the Ladell. 17. ynches, the breadth. 7. ynches a quarter.

Sakers ordinarie, the heygth of the mouth. 3. ynches three quarters, the heygth of the shotte. 3. ynches a halfe, the weygth of the shotte of yron is neere. 6. pounce, the weygth of the peece. 1500. the length of the peece. 8. foote or. 9. foote, and his charge in Powder is. 6. pounce, or thereabouts of Serpentine Powder, the length of the Label is. 15. ynches three quarters, the breadth. 6. ynches. 3. quarters. &c.

Sakers lower than ordinarie, the heygth of the mouth of the peece. 3. ynches a halfe, the heygth of the shotte 3. ynches a quarter, the weygth of the shotte of yron. 4. pounce three quarters, or neere. 5. pounce, the weygth of the peece. 1300. or. 1400. the length of the peece. 8. foote, or thereabouts, and compositeth in Powder. 5. pounce, or

5. pounce v. Serpentine, the length of the Ladell is fifteene ynches, the breadth six ynches and a halfe.

Minyons.

The Minyon is. 3. ynches and a quarter high, in the mouth, the shotte is three ynches bygh, the weyght thereof of yron, is three pound three quarters, the weight of the peece, neere aboute. 1000. The length of the peece eyght foote or theraboutes, and shooteth in Powder three pounce three quarters, or neere foure pounce Serpentine, the length of the Ladell thirteene ynches v. the breadth 5. ynches and a halfe, some foraine peeces lower. The ordinarie Minyon, the mouth three ynches high, the shotte but two ynches three quarters, and weyeth of yron neere three pound, the weyght of the peece about nine hundred, the length of the ordinarie Minion, & shooteth in Powder three pounce or thereabout, the length of the Ladell, 13. ynches, the breadth 5. ynches. &c.

Faucons.

The Faucon, the heygth of the mouth of the peece. 2. ynches three quarters, the heygth of the shotte. 2. and a halfe, the weyght of the yron shotte. 2. and half a quarter of a pound, the weyght of the peece seauen hundred, or seauen hundred and fiftie pound, the length of the peece seauen foote more or lesse, and occupieth in Powder two pound and a halfe, and the length of the Ladell is twelue ynches and a halfe, the breadth of the plate of the Ladell is. 4. ynches and a quarter. &c.

Some foraine Dynaunces not so high as the Faucon, and the mouth of the peece. 2. ynches and a halfe high, the shotte. 2. ynches and a quarter high, and weyeth neere one pound three quarters, and the weyght of those peeces six hundred, or six hundred and fiftie pounce, the length is as the

as the Faucon, and the charge is in Powder neere two pounce, the Ladell is eleuen ynches and a quarter, the breadth foure ynches.

A Fauconet, the peece is .2. ynches and a quarter high, in the mouth, the shotte two ynches high, and the yron shot weyeth one pounce, and neere halfe a quarter of a pounce, and the weight of the peece is aboute .360. or .400 and the length five or six fote, and the charge is of Serpentine Powder, one pounce and a quarter, the Ladell is tenne ynches long, and the breadth of the plate of the Ladell .3. ynches three quarters. And thus much I haue said as touching all manner of peeces that shoote yron shotte, thinking this sufficient for instructions. &c.

How many shottes of Powder ther

is in a last of Powder, from the cannon, vnto the Fauconet, and also, if that you are at any batterie, or in any Towne, Castell, or Shippe, how to know how much Powder will shoote all youre Ordnance, &c.

CHAPTER. II.



And also, I doe think it necessary for all sortes of Gunners, to know how manye shottes of powder they may haue eyther in a last of Powder, as also in a hundred pounce, of Powder according vnto the peeces, whereby they maye readily know, if that they haue any charge of Ordnance in any Towne, Castell, Forte, or Shippes, that they maye know whether that they haue Powder to lade al their Ordnance throughout, & also how oftentimes about y they may shoote al their Ordnance wth so much Powder. And also it is very necessary, if y there be any Ordnance placed against any towne or forte, & if y they haue any number of great Ordnance,

Ordnance, as Cannons such a number, and Demy Cannons such a number, to the intente to batter downe the walles thereof: and then it is very necessary to know how much Powder will shoote all those Ordnance off at one time, and so forth, if that they would continue the batterie, to shoote, 40. or 50. times ouer all their Ordnance in one day, and so to know how many last of Powder that the batterie will require to continue suche a number of dayes: wherefore I doe thinke it conuenient to shew vnto you what a last of Powder is, and that is this. A last of Powder is 24 hundred weight, caske and all, and euery hundred weight to contayne. 112. pound, so that you may make your accompte, that you haue 24. hundred pounde of Powder in euery last, and so is allowed 12 pound in euery 100. weight, for the caske, which is in al allowed for the caske of a last of Powder, 288. pound. &c.

And first this: the biggest sortes of double Cannons doe occupie at one shotte. 46. pound of Serpentine Powder, and you haue. 2. charges in. 100 of powder, and eight pounde remayneth ouer, so that you haue 52. shottes of Powder, in a last of powder, and 8. pound remayneth ouer. And if that it be such a double Cannon, as doth occupie but 40. pound of Serpentine Powder, then you haue 2 shots and a halfe of Powder in euery. 100. weight of Powder, that is iust. 60. shottes in a last of Powder. &c.

And also, those Demy Cannons that doe shoote. 24. pound of Serpentine Powder at one shot, they shall haue foure shottes in a hundred weight of Powder, and foure pound remayneth ouer, and that is a hundred shottes, in a last of powder iust &c.

And also those Culuerings that doe shoote eyghtene pound of Serpentine Powder at one shotte, then there is five shottes in a hundred weighte of Powder, and then there remayneth ouer tenne pound, so that there is a hundred

dyed thirty three shottes in a Last of Powder, & six pound
 remaineth ouer. And furthermoze, those Demy Culurings
 that doe shoote eleuen pound of Serpentine Powder at
 one shotte, then there is nine shottes in a hundred weight
 of Powder, and one pound remaineth ouer, so that there
 is two hundred and eightene shottes in a last of Powder.
 &c. And also for those Sakers that doe shoote six pounde
 and a halfe of Serpentine Powder at a shotte, then there
 is fifteen shottes in a hundred weight, & two or three pound
 remaineth, so that there is. 369 shottes in a last of powder.
 And furthermoze, for Minions that shoote foure pound of
 Powder at one shotte, then there is. 25. shottes in a hun-
 dred weyght, so that there is six hundred shottes in a last
 of Powder. And also those Faucons that doe shoote two
 pound and a half of Powder at a shotte, then there is forty
 shottes in a hundred weight, so that there is, 960. shottes
 in a Last of Powder. And in like manner those Fauconets
 that doe shoote one pound and a quarter of Powder at a
 shot, then there is. 80. shottes in a hundred weight, so that
 there is, 192. shottes in a last of Powder. And thus much I
 haue saide, as touching how many shottes of Powder, ac-
 cording vnto y^e peeces, y^e there either is in a hundred weight
 of Powder, or in a whole last of Powder. And furthermoze,
 if you desire to knowe how much Powder would shoote off
 all the Ordnance, either in a Towne, Fort, or Shippe,
 then looke how many peeces there is of euery sorte, and so
 vntil that you do know how many peeces there is of euery
 seuerall sortes through a whole Towne, or Castell, or
 Shyppe, and then looke how many peeces there is of one
 sorte, multiplie the number of those peeces by the weight
 of the Powder, that one of those peeces doth shoote at one
 shotte, and that will shewe vnto you how many pounde of
 Powder will serue all one sorte of peeces, and by this
 order multiply euery seuerall sortes of peeces by theselues,

& the adde al your nũbers together. & that shall shew vnto you how much Powder wil shoote al your Ordnance off at one time. As for example this. Ther is a towne, y hath 3. double Canons & 6. Demy Canons, and. 14. double Culuerings, & 10. Demy Culuerings, & 30. Sakers, and. 25. Minions, & 28. Faucons, & 12. Fauconets, and. 36. Foulers, & my desire is to know how much Powder will serue all these peeces: therfore first, the. 3. double Canons, & they do shoote 40. lb. of Powder, and. 3. times. 40. is. 120. & then y Demy Canons do shoote. 24. lb. of Powder, & 6. times. 24. maketh. 144. lb. of Powder, and then the. 14. double Culuerings & they do shoote. 18. lb. of Powder, and. 14. times 18. maketh. 252. & then the. 10. Demy Culuerings & they shoote. 11. lb. of Powder, and. 20. times. 11. maketh. 220. & now the. 30. Sakers and they do shoote. 6. lb. and a halfe of Powder, and. 30. times. $6\frac{1}{2}$ is. 195. and then y. 25. Minions, & they do shoote. 4. lb. of Powder. and 25. times. 4. maketh. 100. and then the. 28. Faucons, and they do shoot 2. lb. and a halfe of Powder, and. 28. times. $2\frac{1}{2}$ doth make 70. and then the. 12. Fauconets & they do shoote. 1. lb. and a quarter, and. 12. times. $1\frac{1}{4}$ doth make. 15. and now the 36. Foulers & they do shoote. 2. lb. $\frac{1}{2}$ of Powder, and. 36. times. $2\frac{1}{2}$ maketh. 90. & now this being done, then adde al your numbers together, as this.

Names of peeces.	Peeces number.	Pouder in pounds.
Cannons.	3	120. pound.
Demy Cannons.	6	144. pound.
Culuerings.	14	252. pound.
Demy Culuer.	25	220. pound.
Sakers.	30	195. pound.
Minions.	20	100. pound.
Faucous.	28	70. pound.
Fauconets.	12	15. pound.
Foulers.	36	90. pound.
Summe totall.	174	1206. pound.

And now by this you may conclude, that all this Ordnance doth shoote at one time, to shote the off round once ouer doth require. 1206. lb. of powder, & by this order you may know at al times, whether you are in any town, fort, Castell, or Ship, how much powder will serue al the Ordnance at your pleasure. And furthermore, if so be you haue such a quantity of Powder, and if you would know how oftentimes it would shoote all your Ordnance, rounde aboutes, then you knowing how much powder will shoote all your Ordnance once, and as by the order before is repeated, then deuide your whole summe of Powder by that number of the weight of the powder that all your Ordnance requireth, & that summe that standeth in the quantity line, shal shew you how oftentimes it wil shoote all your Ordnance off: As for example, by the Ordnance in a towne (as before is rehearsed) and suppose you haue. 20. Last of Powder, and now to know how oftentimes it will shoote all your Ordnance off round about thorough the whole Towne, as you did see that al the Ordnance did require 1206. lb. of Powder, & one Last of Powder is 2400. lb. the 20. Last maketh. 48000. lb. wherfore deuide. 48000. by 1206. and then there will stande in the quantity line. 39. and. 966. lb. will remaine ouer, so you may conclude, that twenty Last of Powder will shoote all the Ordnance before rehearsed. 39 tymes ouer, and threc quarters of them more, that is to saye, that it will shoote all the Ordnance off fortye times, lacking almost a quarter of them, &c. And also, if there were any batterie layde againste a Towne, and then if that you doe knowe howe many Cannons or other peeces of Ordnance there is in the batterie, then you maye knowe (as before is rehearsed) howe much Powder that they wyl occupye at once shooting them off, and also if that you wyl shoote them off rounde fortye or fyfthe tymes in one day, then

You may knowe howe much Powder they will spende in one day: as this first (as before is rehearsed.) Multiplie all the Ordnance of one sorte togyther, by the weight of the shotte of Powder, and so the other sorts of Ordnance, and adde them togyther (as afore is said) and that beeing knowen, then multiplie that by the number of times that you haue shotte them off, and that shall shewe vnto you the number of poundes that the Ordnance hath occupied in that day: as for example this: Suppose that there is in a battery against a Towne. 24 double Cannons, and they doe shote. 40. pounde of Powder a peece, therefore multiplie. 24. times 40. and of that multiplication, there cometh 960. and then there is eightteene Demy Cannons, and they doe shote. 24. pounde of Powder a peece, and therefore multiplie eyghtene times. 24. and that maketh. 432. pound, and then adde both the numbers togyther, that is to say. 960. and. 432. & they will make 1392. so that you may see, that the whole battery dothe spende 1392. of Powder at once shooting thereof against the wall of the Towne: and then suppose, that in a day the Ordnance hath beene shot off sixe and fortye times, then how much Powder shall be spent that day, then multipling 1392. by sixe and fortye, and that will mak 64032. so that you may conclude that the whole batterie hath spent in one day, 64032 pound of Powder, and y^e will be sixe and twentie last and a halfe, and 432. pounde of Powder, and then if that the batterie shoulde continue seauen dayes in that order, the whole summe in Powder that shoulde be spent, amounteth vnto 448224. pound, and that maketh 186. Lasts, thre quarters, and 24. pound: therefore by this order you may know from time to time, how much Powder is spent at your pleasure, whether that it be in a batterie or in a Towne, & also how much Powder will shote such a number of Ordnance so many times off

off at your pleasure. And thus much I haue thought good to write vnto you for instructions, &c.

How to knowe how many shotte

doth wey a Tunne.

CHAPTER. 22



Now in so much as I haue shewed in the Chapter going before, to know how much Powder is occupied in Ordnance: so in like manner, I doe thinke it conuenient to shew vnto you how many shots of every seuerall sortes will wey a Tun weight, which is very necessary to be knowne, as wel for them that haue occasion to transport them either by Sea or by land. And first this, a Tunne weight is 20. hundred, and euery hundred for to conteyne an hundred and twelue pound, so that a Tun is 2240. pounce in weight: and first, the double Cannons shotte, and those that doe wey 64. pound, and then 35. shots doth wey a Tun: and then the Demy Cannons shots, and those that doe wey 34. pound a peece, and then 62. or 63. of those shots do wey a Tun: and the Culuering shot of seauentene pound a peece, and then 131. or 132. wil wey a Tun: & also the Demy Culuerings, and those shots that do wey tenne pound a peece, and then there is 224. in a Tun. And furthermore, those Sakers, that the shot doth wey sixe pound, and there doth go. 373. or 374. vnto a Tun: and in like manner the Pi-nions, and commonly their shottes doe wey three pounce three quarters, and 597. or 598. shots will wey a Tunne. The Faucons shots doth wey two pound & halfe a quarter, and 1054. or 1055. doth wey a Tunne: & the Fauconet shot weyeth one pound, and neere halfe a quarter of a pound, and, 1991. or 1992. doth wey a Tunne. And thus

L iii.

much

much I haue saide, as concerning how many shottes of euery seuerall sortes doth wey a Tun weighte, but if that you haue a great number of shottes of seuerall sortes, and you do desire for to know how many Tunnes there is in all of them, multiply euery seuerall sorte by themselves, according vnto the weight, and so adding all the numbers together, and then deuide that number by 2240. and it will shewe vnto you howe many Tunnes there is in the whole summe. As for example this, there is such a number of shottes to be transported, either by Sea, or by land, and you woulde knowe howe many that there is of them, as first, that there is a thousand Cannon shottes, and a thousande two hundred Demy Cannon shotte, and two thousand Culuering shotte, and three thousand Demy Culuering shotte, and three thousande five hundred Saker shotte, and foure thousand Minton shotte, and five thousande Faucon shotte, and sixe thousande Fauconet shotte, and nowe for to knowe their weighte, and first for the Cannon shotte, and those that be seauen ynches three quarters high, and those doth wey 64. pound a peece, and then being a thousande shotte, then therefore multiplie a thousand times 64. and that maketh 64000. and then there being 1200. Demy Cannons shotte, that are sixe ynches a quarter high, and those doe wey foure and thirtie pound a peece, and therefore multiplie 1200. times 34. and that maketh 40800. and then there is 2000. Culuerings shotte, of five ynches almost in heigh, and they do wey 17. pound a peece, and then multiply two thousand times seauenteene, and that maketh 34000. and the there is three thousand Demy Culuering shotte, of neere foure ynches and a quarter in height, and they doe wey tenne pound a peece, therefore multiply three thousande times tenne, and that maketh 30000. and then there is 3500. Saker shotte, that is three ynches and a halfe high, and

and that weyeth, 6. lb. and therefore multiply. 3500. times 6. & of that there cometh 21000. & then there is. 4000. Minion shot, of iust 3. ynches high, and they doe wey 3. lb. 3. quarters a peece, and therfore multiply. 4000. by $3\frac{3}{4}$ & that wil make 15000. & then there is. 5000. Faucon shot, and they be 2. ynches and a halfe high, and doth wey. 2. lb. and halfe a quarter: therefore multiply 5000 by $2\frac{1}{4}$ and that will be 10625. & then there is 6000. Fauconet shot, of 2. ynches high, and they do wey one pound, and halfe a quarter, & that cometh in weight 6750. and now adde al your numbers togither, as by this example following.

Names of pceces	Number of shots.	Weight in poundes.	Tunnes,
Cannons.	1000	64000	28 $\frac{4}{7}$
Demy Cannons:	1200	40800	18 $\frac{1}{4}$
Culuerings.	2000	34000	15 $\frac{1}{8}$
Demy Culuerings.	3000	30000	13 $\frac{1}{8}$
Sakers.	3500	21000	9 $\frac{3}{8}$
Minions.	4000	15000	6 $\frac{3}{8}$
Faucons.	5000	10625	4 $\frac{11}{16}$
Faconet.	6000	6750	3 $\frac{3}{4}$
Summe totall.	25700	222175	99 $\frac{1}{4}$

And now, al those numbers being added togither, doth make 222175. pound in weight. And now to know how many Tunnes there is in al them, deuide the 222175. by 2240. and that being done, then there will stande in the quantitie line. 99. and 415. will remayne ouer, so that you may conclude, that of all the shotte there is 99. Tunnes, and 415. lb. that is neer $\frac{1}{4}$ parte of a Tunne more, so that there lacketh little more then thre quarters of a Tunne of 100. Tunnes, and by this order or meanes, you maye knowe how many Tunnes of shot there is in any number of shottes. &c.

How

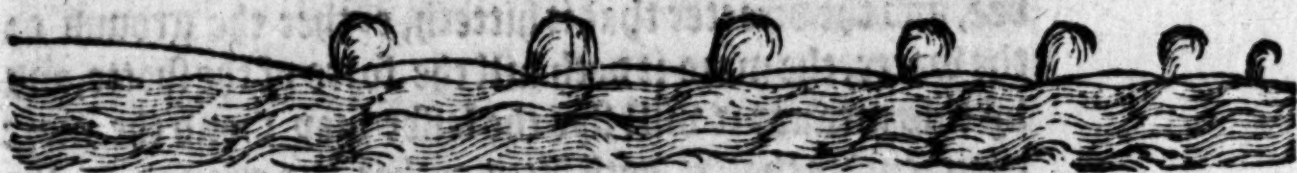
How and by what order the shot doth graze or glaunce vpon the lande, or water.

CHAPTER. 23.



Or to know by what order that the shot
doth graze or trundle either vpon the
land, or the water, it is to be noted, that
it dothe graze or trundle farthest, when
that the peece is laid point blanke, if that
you do shoote the peece towards the wa-
ter, or aplane or leuell ground, and then the shotte shall
rune or graze neere three quarters of the beste compasse
of the Randare, so that the shotte bee not lette by anye
chance by the way: and there is on great diuersitie in di-
stance of the grazing or running of the shotte, betweene
the land and the water, so that the ground be a playne and
leuel ground, and the water or Sea to be smooth. And here
is one thing to be noted, as touching the grazing of the
shotte, whether it be vpon the water or the land, looke by
what proportion the shotte doth strike or hitte the ground
or water, by that proportion the shotte shall rise againe,
although that it flyeth not so farre in that proportion, as
long as the shotte hath force or vrisite in his flying, that is
to say, if the shotte do strike or hitte any thing glauncingly
that then it shall glance in that proportion from you-
wardes, and if do strike or hitte anye thing directly, then
it shall be driven directly backe agayne, if it doe not enter
or sticke fast in the thing that it hitteth, even like the sha-
dowe of the Sunne, or anye other thing in the water or
glasse, or such other like. As for exaple this. If you shoote
anye peece of Ordnance towards the water, and lay the
peece at the poynte blanke, and the peece be but little
higher

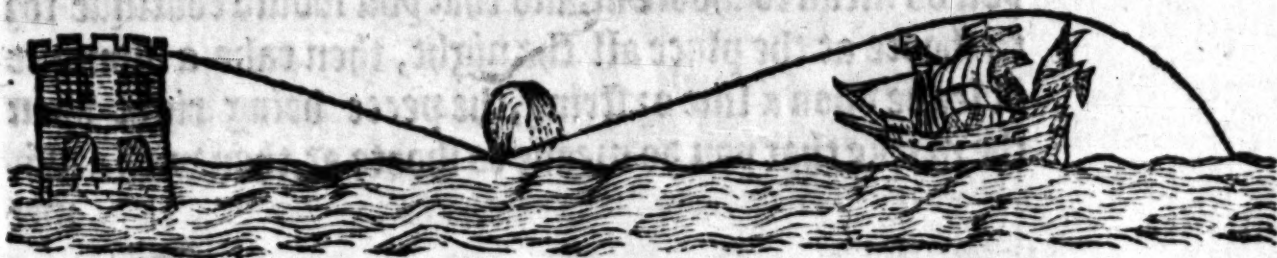
higher than the water, then shall the shotte runne grazing in this forme, to rise againe by that proportion that it doth hitte the water, and so to runne, till that the great force be decayed, as this example doth shew.



And furthermore, if you doe mount the peece at much aduantage, then it will not graze at all, if it do graze, then it will be made in this manner,



And furthermore, if you doe shoote at any Shippe vpon the water, and you do shoote in that peece that do lye very high, and the shippe or marke neere hand, so that you must giue your leuell downewards, then if you doe giue your leuell shoote of the shippe, the shot will flye ouer the Shippe, by the meanes of the direct hitting of the water, for that the shot doth glaunce from the water, by that proportion that it doth hitte the water, as by this example.



So that you may iudge by this example, by what proportion the shotte doth graze, either vpon the water or the lande : but the water is the more certayner and truer if it bee smooth and calme, for that the water is not harder in one place, than it is in another, as the ground is or may bee, and the directer that it hitteth, eyther the ground or the water, the more it doth kill the force of the shotte, and by this meanes it will flye the lesser way : and the more glauncingly that it doth hitte eyther the ground or the water, the oftner it it doth glaunce or graze, and the further it flieth. &c.

Howe to batter the walles of any

*Towne as well by night as
by day*

CHAPTER. 14.

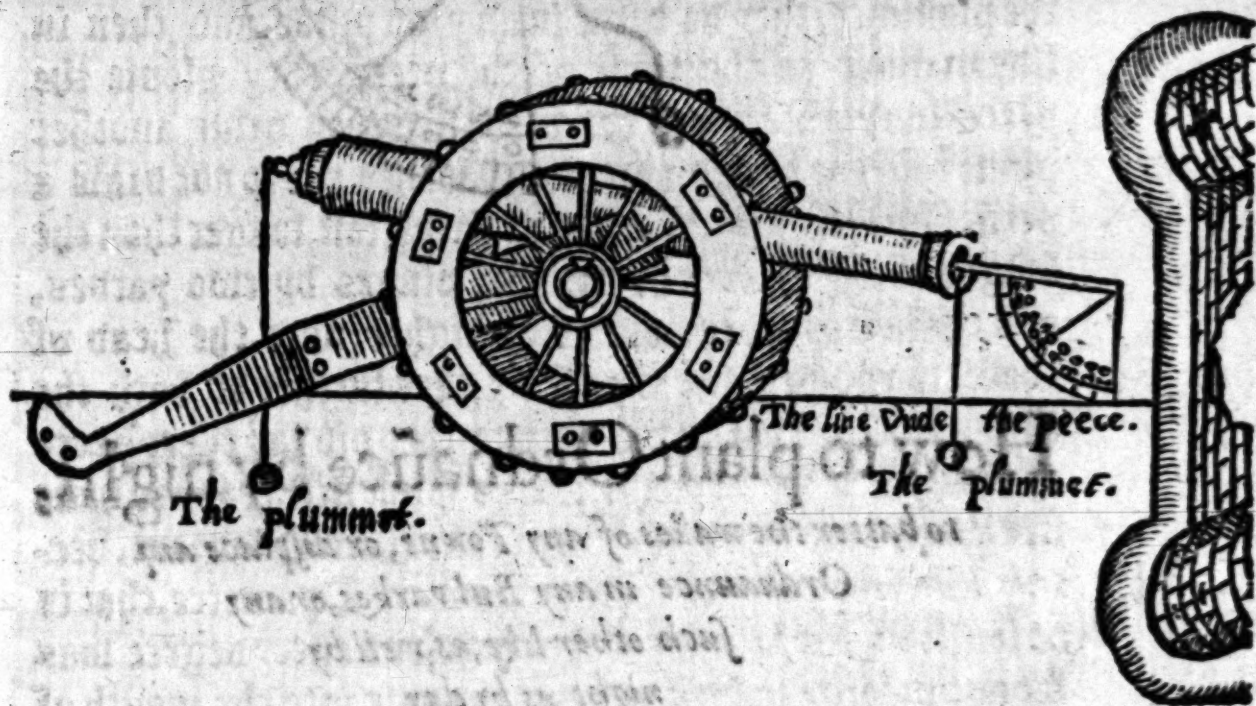


Although it hath not beene commonly used, yet notwithstanding it may be easily done, for to plant their Ordnance so, that they may batter or beat down the walles of a Towne as well by night as by day, although the night be neuer so darke. And also there shal no light appeare vnto the enimie, as thus. First after that your Ordnance is placed for your batterie, and you haue begunne to batter, & then the peeces being made ready for to shoote at the wall or place that you do mean to shoote at, and that you would continue for to shoote at the place all the night, then take a plummet of leade vpon a line or string, the peece being right vpon the marke that you do meane to shoote at, then with a plummet

met and the line, first plome the middle of the mouth of the peece downe to the ground, and looke where the leade falleth to the ground, there make a mark vpon the ground, and then in like manner plome the very middle of the taile of the breeche of the peece vnto the ground, and there make a mark also vpon the ground, and then draw a right line from the one place vnto y^e other, as long as you list, & then that right line wil lye right vpon the mark, the take a large great Quadzant, set out with degrees, & parts of degrees, & the Quadzant, for to haue a rule fastned vnto it, and then the peece being laid ready for to shoote at the marke, hauing the true height of the marke, that is to say, that the hollow or concauitie of the peece doe lye right vpon the marke, neither higher nor lower: then put the rule into the mouth of the peece, and looke at what degree or place that the plummet line dothe hang vppon, then note that in some Booke or paper, and then when that the night is come, and that you doe meane to shoote as well by night as by day, then first with your plummet of leade vppon a line, then plome the mouth of the peece right vppon the line that is vnder the peece, and that will laye the peece right vppon the marke, and then in like manner take the Quadzante, and putte the rule into the mouth of the peece, and then korne the peece vppon and downe till that the plummet line doth fall vppon that degree and place that it did befoze, and then that in like manner will giue the peece the true heigth of the marke without any fayle. And for to see whether that the plummete line doth hang vppon the degree or place that it did befoze, and also to knowe by the line and the plummete with the lyne vppon the ground vnder the peece, for to laye the peece ryghte vppon the marke, there muste bee prepared a close Bore lyke a Lanterne,

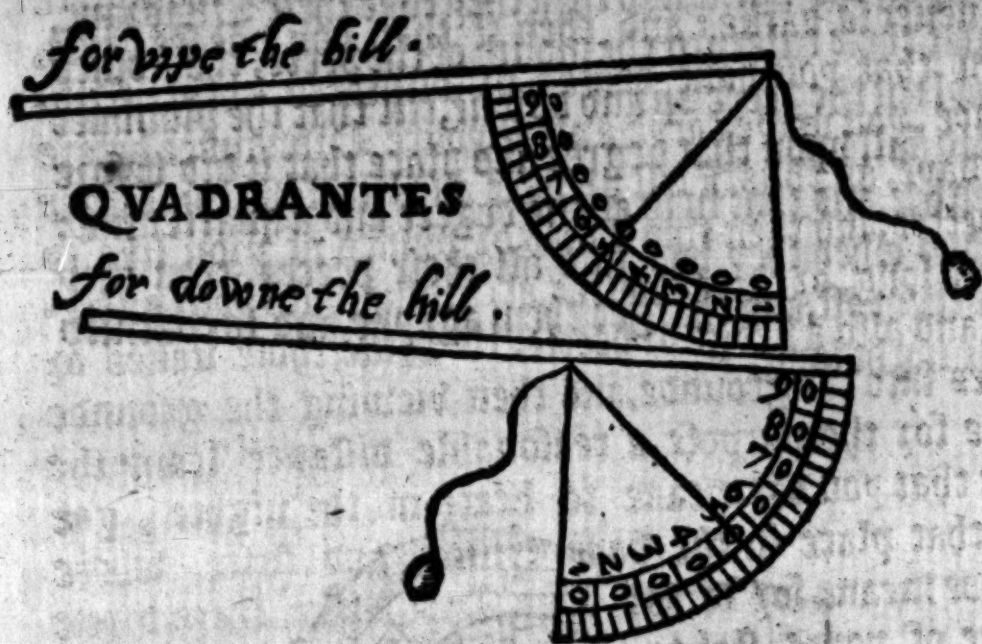
Lanterne, made with boordes, with a doze or a liode for to open and shutte, to the intente to see how the plommet doth hang, and so forth, as for example, supposing that at the seege of a Towne, the Ordnance being placed, and had battered al the day, & to continue that they shoulde not make by their breach in the nighte, and furthermore, that the breach shoulde be made wyder in the morning, then they wente vnto the middle batterie called the persers, and there tooke a plommet of leade and a lyne, the peeces beeing all charged and leuelled vnto the breache and markes appoynted, and firste, the plommet at the middle of the mouth of the peece, and then righte vnder the plommet, they do driue in an yron pinne, and then in like manner at the tayle of the peece, they plome the peece, and righte vnder the plommet they driue another pinne into the ground, and for that they could not draw a perfite line, they made a line of string fast, longer than the length of the distance of the two pinnes by two partes, and the line of threed did come righte ouer the head of those two pinnes, and so passed a yard further at both the ends, than the two pinnes: & thus they did lay euery peece at that place, and then the peeces lying still, ready to haue fire giuen vnto them, then they take their Quadrant, beeing very large, of two foote in the semy Dyametre, that is to say, from the Center of the circle, end euery degree was set out in foure partes, and put the rule into the mouth of the peece, and the plommet line did hang at one degree and a quarter iust, and that they did note in a booke for remembrance, and this being done, they shotte off theyr peeces. And now when that the nighte was come, and the same very darke, and the morning very foggy, so that they could not see the walles of the Towne, yet they battered the walles of the Towne as perficely all the night, and as well as though it had bin by day, for euery time y^e they

they had charged all their peeces, they did this, first, they did plome the mouth of the peece, and likewise at the talle of the peece, right vppon the line that was vnder y peece, right vpon the mark, and then they toke their Quadzant, and put their rule into the mouth of the peece, the koined the tayle of the peece vp and downe, till that the plummet line did fall vpon that degree and place that it did before the nighte, and that was at one degree and a quarter iust: and thus when they had laid all their peeces, then they shotte them off, and charged them agayne, and so continued all the night long.



And so in this manner, they may in like case handle the two side batteries, but and if that it chance that the battering peeces doe lie vppon hygher ground than the place that is battered, then y rule that is fastned, must be vnto that place wheras the plummet is made fast vnto, for that

that the degrees goeth downewards towards the lower ground as you may see by these two figures.



How to plant Ordnaunce by night,

*to batter the walles of any Towne, or displace any
Ordnaunce in any Bulmarkes, or any
such other like, as well by
night as by day.*

CHAPTER. 25.



Et furthermore, there maye be meanes
founded, that if there be any Ordnaunce
placed that doth damage or hurte you,
and that you maye not come at it by no
meanes in the daye for to displace their
Ordnaunce, but vnto your greate hurt
and losse, both of men and Ordnaunce, yet you may dis-
place

place them by nighte neere as well as by day, both for to place your Ordnance in the night, and also for to shoothe perfectly vnto the place in the night, although the night be neuer so darke: and then if that you doe see cause, when that you haue beaten or displaced theyr Ordnance, you maye carpe awaye your Ordnance before it is daye, as thus. First prepare an Astrolabe, the larger the better, and then two stakes or pinnes of yron like to a foote long, or thereaboutes, according vnto your discretion, and also a sledge or beetle, to driue those stakes or pinnes into the grounde, and then viewing the grounde meete for the purpose a reasonable distance from the place that you doe meane to beate in the night, goe into that place in the daye tyme, and firste where you doe meane for to lay your Ordnance, there driue in one of your stakes, and then in lyke manner goe backwardes about twentye foote, and stande so, that you maye see the marke that you doe meane to shoothe at ouer the toppe of the sticke that you haue driuen, and then there in that very place driue your other stake, and then goe a little backwardes moze, and biewe whether that the two stakes stand as one right line vnto the marke, and if that they doe not, you maye amende them, and sette them ryghte, then take your Astrolabe, and holde that vppon your thombe by the ringe, and then turne your Achilleyday or Rule wyth the two sightes that is on the backe side of the Astrolabe vppe and downe, tyll that you maye see that place that you doe meane to shoothe at, thozough the two syghtes of the Achilleyday holpyng that vppe before your eyes, winking wyth one of your eyes, standing at that place where you doe meane for to place your Ordnance that is betweene the two stakes, then looke vppon the Achilleyday or Rule wyth the two sightes.

at what degree and place that the ende doth pointe vnto, then remember to write that degree, and place it in some Booke or Table, for that it is finished: then in the nyghte you may bring your Ordnance vnto that place between the two stakes, and then place one of your peeces right betweene the two stakes, and then take a threed or line, and make that fast vnto the two stakes, and that shall lay the peece right vpon the marke. And then for to place the rest, they must doe this. First on the one side measure out iust how many foote you doe meane to lay your peeces in distance asunder, then from the line of the stake, measure it truly, and there make a marke, or driue a stake: and then at the other end, at that certayne distance, there in like manner driue another stake: then betweene those two stakes place another peece, and then make a line fast vnto those two stakes, and that in like maner shall lay the peece right vpon the marke, and then you may place another peece vpon the other side of the peece, and so forth. And then when your Ordnance is all charged, then plome the middle of the mouth of the peece right vpon the line, vnderneath the peece, and then in like manner, the middle of the taile of the peece to be plomed, that it stand right ouer the line, vnderneath the peece, and then take your Quadrant with the rule fastned vnto it, and put the rule into the mouth of the peece, and then koyne the peece vp and downe, till the plommet line do fall vpon that degree and place that the Athilleyday did pointe vnto vpon the Astrolobe, and that shall giue the peece the true height of the marke. As for example, suppose this after the breach in the wall of the Towne was made faultable, there the flankes lay so, that they coulde not come neere vnto the breache, neyther could they plant their Ordnance for to displace those flankes, but that they shoulde bee beaten from their Ordnance to their great losse and hinderance, therefore

therefore firste they prepared an Astrolabe of the largest
 sort, & two pinnes of yron made sharp at the endes, to goe
 into the ground, and then they caused an assaulte to be gi-
 uen vnto the contrary side of the towne, and whilst they
 helde them play there, then two or thre chose out thyr
 ground meete for their purpose, and ther drove one pinne,
 and then they went backe twenty foote, and right against
 that pinne they drove another pinne so euē, that the two
 pinnes, and the place of the bulwarke where the flankers
 lay, were all there vpon one right line: and then one of the
 tooke the Astrolabe, hanging it perpendicularly vpright,
 then they turned the Achilley day vp and downe, till hee
 mighte see thorough both the sightes, the very place that
 the flankers lay, and then they departed, and wente their
 way, and looked vpon what degree the poynte of the A-
 chilley day stood vpon, and found it to be vpon iust two
 degrees and a halfe, and that they wrote in a booke for re-
 membrance, and then after a night or two, when they saw
 their time, the nighte being very darke, then they carried
 thre peeces of artillerie, and placed the chiefest betweene
 the two pinnes, and vnto those two pinnes they made a
 line fast vnto them both close vnto the ground, and then
 they placed vpon the one side, one of the peeces, and the
 other peece vpon the other side, as this. First they measu-
 red out tenne foote from the foremost pinne iust vpon the
 one side, making a perfite square angle, and then in like
 maner they measured out .10. fote more at the hindermost
 pinne, so that those two pinnes stode iust .20. fote asunder,
 & so placed the peece betweene those two pinnes: & nowe
 for that they must shoote all thre peeces vnto one place
 where the flankers lay, & for that the peeces did lye .10. foot
 asunder, therefore they remoued the hindermost pinnes of
 both sides .4. inches, so that there was .10. fote distāce, &
 4. inches, & the cause was this, for that the marke was .10.

Thoze off from the place where the peeces lay, and the peeces lay iust from the middle, vnto the middell, tenne foote asunder, and the line vnderneath the peece, was iust twentie foote long, and there is thirtie tymes the length of the lyne vnderneath the peece vnto the marke, and thirtie inches maketh two foot and a halfe, and foure times two foote and a halfe, maketh tenne foote, so that the hyndermost pinne beyng remoued foure ynches further off, must needes lay that line iust vpon the marke that the middlemost lyeth vpon, without any faile, and in this order the one peece was placed on the one side, and the other peece on the other syde: and nowe those peeces beeing charged, firste they plome the mouth of the peeces righte vppon the lyne, and then in like manner the breeche or tayle righte vppon the lyne, and then they tooke theyr Quadrante, and putte the rule into the mouth of the peece, and koynd the breeche of the peece, till the plummet line fell at two degrees and a halfe iust, for that the Achilleyday vnto shewe vnto them on the Astrolabe: and they shooting off those peeces, they made a perfitte shotte at the place appoynted, and thus they charged and shotte all the nyght, and then before day, when they hadde serued their turne, they conueyed their Ordnance from that place, for feare of being beaten away from them when it was day light.

And furthermore, by that meanes in like manner, they may place their Ordnance in the night out of a Towne, to annoye their enimies, as they may or can by no deuice or practise, but by industry or policie they may be preuented by practise, and especially if that he doe knowe what the enimie doth meane for to doe, for this wee doe see many times in warres, that policie doth preuaile as oftentimes as greate and huge armies of menne of greate strength, hauing all kinde of engines for that purpose, for

euen

even as it pleaseth God, so goeth the victorie, although it cometh by a naturall cause, and that naturall cause that I speake of, is knoweledge and industrie in those affaires;

How to keepe a Hauen or Riuer

on the Sea coast for to sincke a Shippe as well by night as by day in all pointes.

CHAPTER. 26.



Now for the keeping of a Hauen or Riuer, there maye be suche meanes or wayes vled by industrie, that you maye keepe a Hauen or Riuer in this sorte, so that there may no Shippe passe neither by night nor by daye, but that hee shall be sunke, or else he escapeth very hardly, although y^e nighte be neuer so darke, so that the night be not foggy or mistie, so that the Hauen or Riuer be not aboue a mile broad or ouer, as this. First, if the entraunce of the Riuer be therefore, to haue a watche there, then as soone as the watch doth perceiue thē and their number, then they must haue a watchtoken, and that must be a light or lights vnto the Castell or Bulwarkes, and then the watchtokens beeing so agreed vpon that the Castels or Bulwarkes may know y^e number of the Shippes by the forme of the lights of the Castels or Bulwarkes, if that they be on the one side, & the other on the other sid, thē at certaine knowē places appointed for that purpose, and at a certaine distance from the Castels or Bulwarkes towards the Sea wardes, each of thē for to carrie a light thither, & to place the lightes as neere the water as may bee, and if that it

chanceth so, that ther is but one Castell or bulwarke, and none vppon the other side, then they hauing a bote or Skiffe, or any other craft, they may rowe ouer the water, and place their Lightes in that knowne place appoynted, and then afore night, that place beeing alwayes knowne vnto them, they may place their Ordnance right vppon that marke vppon the farther side of the water, the Light stāding alwayes to the Seawardes of the marke that the Ordnance is placed right against, like. 20. or. 30. foote, & then the night being neuer so darke, the light is y better seene: then must the Shippes needes in their comming be tweene the light and you, take away the lightes of youre lightes, and then immediately, as soone as you do see that the light is shadowed, then giue fire vnto those peeces that be placed against your ymagined marke appoynted, & then there is no doubt but you shall make a perfit shot at that Shippe, being sure that the mouth of the peece bee koynd lowe ynough, leaſt they shoulde shoote ouer the Shippe, & especially if it be in a place where it doth ebbe and flowe: for at the full Sea, they must koyne the peeces at one proportion, and at a low water, at another proportion: and this being handled discretely, they shall not faile the hitting of y Ship. And furthermore, as it is declared in the. 2. Chapter going before, they maye haue a line drawn vnderneath the peece vpon the ground for to lay their peeces right vpon their appointed marke at al times after y they haue shot off their peeces in the night, then in the night they may place the againe, &c. As for example, Heere with vs at graues end, as there is. 2. Bulwarkes y one right against the other, the riuer of Thames running betweene them, and nowe they would keepe the riuer so, that there shoulde no Ship passe, neyther by night nor by day, but that they shoulde be sonke: then they must keepe a watche at the Masse or poynt belowe, at the entrance of y

Elber.

Tilberrie hope, and that is a mile and a halfe from the Bulwarke, and there alwayes they must needes see them, and their number of Shippes, and specially by the help of a light vpon the further side of the water, and then they beeing knowne vnto the watche, the watche must make vnto them a token by a light or lightes that they haue agreed vpon before, and then thorough the watche token, the Bulwarke knoweth that they cometh such a number of Shippes, or but one or two as it chanceth, and then each of the Bulwarke hath an imagined marke, twentie ffoote towards the Masse or Seawards, y they do alwaies plant their Ordnance right against it, both by day, and by night, and then as soone as they doe see their watchtoken then both the Bulwarke do place their lightes hard vnto the water, like twenty ffoote to the Seawards of their imagined marke: then the peeces being planted and koynd, so that the dispart standeth vnderneath the poynnt blanke at the full sea one degree, and at the lowe water thre degrees, then giuing fire vnto the peece or peeces, as soone as the Ship taketh away or shadoweth y light, the theris no doubt but they do strike the Ship very neere y water without any faile. And for that the lighte standeth to the Seawards of the marke appointed, the shott must haue a time to come vnto the Ship, and the Ship goeth away in the meane time. And furthermore, when that the peeces bee charged againe, then the line that is vnderneath the peece, by plomming of hit at the mouth, and at the tayle of the peece, is laid right vpon the marke agayne: and the furthermore, if the Shipp chance to passe further, scaping both the Bulwarke, then they may haue more ymagined markes, and also lightes placed there, and in like manner, lines vnderneath the peeces right vpon those markes. &c. And furthermore, you may know by the lightes, whiche side of the water the Ship cometh two wayes, and one

way is this, the land being higher then the water, and the lightes being placed hard vnto the water, if that the ship commeth hard vpon the further side of the water next vnto the light, then the hold of the ship will shaddowe the light, and if that she commeth on your side, then the sayles will shaddowe the lightes. And furthermore if the Ship commeth right in the middle of the water or Riuer, then both the Bulwarke shall haue the lightes shaddowed at one time, and if the Ship come on the further side of the water from you, then your lightes will bee first shaddowed, and if on the side you be on, then your light will bee last shaddowed: and then furthermore for the making of a perfitte shotte, if that the other Bulwarke shoote before you, then koyne the mouth of the peece one degree lower, for that the Shippe commeth vpon your side of the water, and then for the neerenesse of her comming, you must needes koyne the peece so much the lower. &c.

(.)

FINIS.

Some deserue ere they desire,
 And yet shall lacke when they require,
 Some desire and neuer deserue,
 And gets the gayne the other shall sterue.

**The Table of the contents of this Booke, called
The Arte of shooting in great Ordnance.**

First, tenne principall things to be considered in the shooting of Ordnance.

1. Pouder the goodnesse or badnesse
2. The lading of the peece.
3. The winde.
4. The shotte.
5. The wadde or pouder too harde or loosse
6. The standing of the peece.
7. Of shooting vp the hill or downe the hill.
8. Of the length of the peece.
9. Of the disparting of the peece.
10. Whether the peece be truly bored.

Now beginneth the first Chapter of the Booke, called The Arte of shooting in great Ordnance, & first, as concerning pouder

The 2. Chapter sheweth, how to knowe whether any peece of Ordnance be truly bored, by the help of certaine instruments.

The 3. Chapter sheweth, how much pouder will serue any peece of Ordnance by the weight of the peece, and weight of the shot, and at the end of this Chapter there is a Table that doth declare the weight of yron shotte.

The 4. Chap. sheweth how to dispart any peece of Ordnance truly.

The 5. Chapter sheweth how to giue leuell with any peece of Ordnance to make a shotte, according as the most sortes of Gunners doe vse to do, although that there is no arte in it.

The 6. Chapter sheweth what a degree is.

The 7. Chapter sheweth how to make a shotte vpon the righte line, and so how to know how much ground that any peece of Ordnance doth driue or conuey a shotte at the mount of euery degree of the Randare.

The 8. Chapter sheweth, how to mount any peece of Ordnance by the degree with an ynche rule with a table, shewing what part of an ynche rule will make one degree, and so vnto tenne degrees.

The 9. Chapter sheweth, what manner of course the shot flieth in the ayre.

The 10. Chapter sheweth, how to mount a Morter peece, for to lay the shotte at any distance appoynted.

The 11. Chapter is how far aboue the marke the shot flieth ouer the mark by the length of the peece, and distance vnto the marke.

The 12. Chapter is, how to make a perfit shotte with a peece that is not truly bored, that is to say, that the core or hollownesse goeth not right in the middle of the mettall.

The 13. Chapter is how to giue leuell at a marke vpon a hill or valley with the Quadrant.

The 14. Chap. is how to make a perfit shot vpon the land, at the broad side of a ship that is vnder saile, and going.

The 15. Chap. is, how to make a shot out of one ship into another, although the sea be wrought, or out of a Galley into a shippe.

THE TABLE.

The 16. Chapter sheweth vnto you in what order you should place Ordnance in Shippes

The 17. Chapter sheweth vnto you how for to shoot at a moueable marke vpon the land, and also what kind of shotte is the best to be vsed according vnto the cause.

The 18. Chapter sheweth, how you shall knowe if any peece of Ordnance be sufficiently mettalled, and also the cause that the Cánós do not occupie the weight in powder that the shot waierth.

The 19. Chapter sheweth in what order you shall giue leuell with your Ordnance at a batterie, to beate downe the walles of any place, and also, what to obserue in the giuing fire vnto them.

The 20. Chapter, sheweth the weight of al manner of cast peces of Ordnance, from the Cannon, vnto the Faulcōnet, and also the weight of the shot & the weight of the powder that they do occupie with the heigth of the shot, and length of the peece, and al such other like causes, according vnto the names of the peeces

The 21. Chapter sheweth, how many shottes of powder there is in a last of powder, from the Cannon, vnto the Fauconet, and also, if you be at any battry or in any towne castel or shippe, how to know how much powder wil shoote al your Ordnance off.

The 22. Chapter sheweth, how to know how many shotte doth wey a Tunne.

The 23. Chapter sheweth how and by what order the shote doth graze or glance vpon the land or water.

The 24. Chapter is, how for to batter the walles of any Towne, as well by nighte as by day.

The 25. Chapter doth declare how to plant Ordnance by night, to batter the walles of any Towne, or displace any Ordnance in any Bulwarkes, or any such other like, as well by night as by day.

The 26. Chapter doth declare how for to keepe a Hauē or Riuer on the Sea coast for to sincke a shippe, as well by night as by day in all pointes.

FINIS.



AT LONDON,

Imprinted by Thomas Dawson

for Thomas woodcocke.

An. Dom. 1587.

LE GRAND ROV-

TIER, PILOTAGE, ET EN-

CRAGE DE MER: TANT

DES PARTIES DE

France, Bretagne, An-

gleterre, que haul-

tes Alemai-

gnes.

*Les dangers des Ports, Haures, Riuieres, & Chenals
des regions susdictes.*

Compost, ou Calendrier tresnecessaire pour la Mer.

Les iugemens d'Oleron, touchant le fait des Nauires.

Par Pierre Garcie, dit Ferrande.

Reueu & corrigé de nouveau.



A LA ROCHELLE,

Pour Marin Villepoux.

M. D. LXXXVIII.